MARINE REVIEW

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Sault Canal Celebration

The semi-centennial of the completion of the first canal at Sault Ste. Marie was celebrated with appropriate exercises on Wednesday and Thursday of this week, at Sault Ste. Marie. This canal was begun in the spring of 1853 and water was let into its completed channel in April, 1855. The first vessel, the side-wheel steamer Illinois, was locked through on June 18, 1855, and was, therefore, the first vessel to make a continuous trip through the lower lakes into Lake Superior. The steamer Baltimore, which passed down shortly after, was the first steamer to make a continuous trip in the opposite direction. A chart is published elsewhere in this issue showing in the most graphic manner possible the growth of tonnage through this canal since it was completed. In point of commerce it has grown to be the world's unrivaled canal. There is really no artificial waterway that can adequately be called second to it, since even Suez does not do one-third the business of Sault Ste. Marie.



THE HON. PETER WHITE.

Special rates were made on the railroads and steamship lines and the attendance at the celebration was large. Charles T. Harvey, who built the first canal in 1855, was present and acted as chief marshal of the occasion. The maritime display, being merely the accumulation of a few hours, was excellent and afforded a striking contrast to the scene of fifty years ago, when there were scarcely more than a dozen vessels altogether on Lake Superior, the whole of which could have been very comfortably stowed away in the hold of any one of the steamers lying at the docks.

The historic town of Sault Ste. Marie was brilliantly decorated in honor of the occasion. By day it was gay with flags and bunting and at night sparkled with innumerable electric lights that had

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been specially strung in honor of the celebration.

The celebration the first day consisted of band concerts, a military parade and Indian games. The Indian is the original inhabitant of Sault Ste. Marie. While it is the oldest town in Michigan, the Indians were there long before the white man came, and as far as can be determined there has always been a permanent settlement at the rapids. On Wednesday evening there occurred a fine illumination of the canal, the rapids and St. Mary's river, the vessels mobilized in the harbor shooting off fire works.

Thursday was generally given over to the commemoration exercises. The address of welcome was delivered by the Hon. Chase S. Osborn of Sault Ste. Marie. Governor Fred M. Warner of Michigan, delivered an address upon "The State of Michigan and the Building of the St. Mary's Canal." The historical address, "The Development of the Lake Superior Region," was delivered by the Hon. Peter White, president of the Semi-Centennial Commission. Senator Julius C. Burrows spoke upon "The Future of American Commerce." The Hon. T. E. Burton, chairman of the committee on rivers and harbors of the house of representatives, delivered an address on the improvement of waterways, and William Livingstone, president of the Lake Carriers' Association, spoke upon the subject of "Navigators of the Great Lakes," Attention will be paid to these addresses in the next issue of the *Review*.



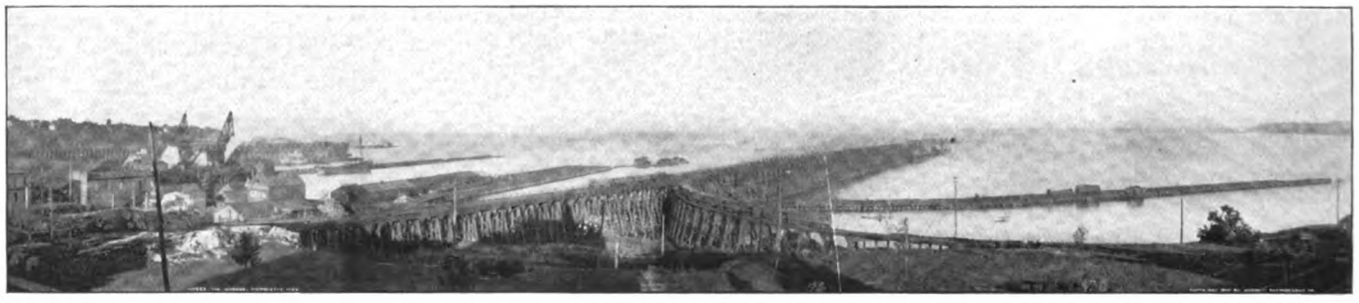
SAULT STE. MARIE CANAL.

In his historical address the Hon. Peter White spoke as follows:

Peter White's Address.

"We are gathered here today to celebrate an event which is Michigan's greatest contribution to the material welfare of the American people, and the thoughts that come over me are very solemn ones indeed. More than fifty years have gone by since I first stood on this precise spot. How variously the aspect has changed since then would be unbelievable were it not lying open before our very eyes. There was no canal when I first came here; nor for nearly ten years thereafter was there one. Ten years before that Michigan had just been admitted to the sisterhood of states and had almost gone to war over the inclusion of this upper peninsula within her boundaries. She wanted the Maumee Bay, which now includes the city of Toledo, because as a territory this strip was included within her boundaries under the ordinance of 1787. When the Maumee Bay was included within the boundaries of Ohio, it was to appease Michigan that the upper peninsula was literally thrust down her throat by congress. Congress did not know at that time what it was giving or Michigan what it was getting. There is no portion today of this great round globe so inaccessible as was the upper peninsula at that time.

"I have always considered that the greatest service which the great Benjamin Franklin rendered to his country was that which he rendered when he deflected his pencil a bit on a certain memorable occasion and caused the upper peninsula of Michigan to be included within American territory. Had it not been for the foresight of Franklin the upper peninsula of Michigan would now be Canadian territory. He had heard vague stories of mineral wealth within the peninsula, and it was this information that caused him to deflect his pencil—a wise and far-seeing act and one which Franklin himself said might some day be regarded as his greatest service to his country.



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PANORAMIC VIEW OF MARQUETTE HARBOR AS IT APPEARS TODAY.

"For centuries it had been known that this region was rich in metallurgic substances. As early as 1636, Lagarde, in a little book published in Paris, made known the existence of copper in that far country by the unsalted seas. The Jesuits, too, in their recital of their missionary work which extended from 1632 to 1672, frequently spoke of the existence of copper. Claud Allouez visited the Lake Superior region in 1666 and makes mention of a large mass of native copper which was plainly visible there near the shore of the lake, and relates that the Indians who passed that way cut pieces from it. The first

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attempt at development was made as a result of the account of the mineral deposits related by Captain Jonathan Carver, who visited Lake Superior in 1765. His story so influenced Alexander Henry, an Englishman, that he organized a company to exploit the resources of the region. Many of the nobility of England went into this venture. Henry and his company built a barge at Point Aux Pins and laid the keel of a sloop of forty tons. They also erected an air furnace at Point Aux Pins. Tney found specimens of silver, lead and copper, but not in such quantities as to make Henry's partners contribute further to the venture.

"Nothing further was done towards the development of this region for nearly three-quarters of a century, or not until Michigan was admitted into the union of states, nor in all probability would it have been done then had it not been for the rare intelligence and great energy of Dr. Douglas Hougton, who went to Detroit in 1830 at the solicitation of General Cass to deliver a course of public lectures on chemistry and geology. Houghton was a natural scientist, and long before Michigan became a state he nurtured the scheme of a geological survey, embracing the departments of geology, zoology, botany and topography. The survey was at once authorized by the legislature and Governor Mason appointed Houghton as state geologist. For seven years thereafter Houghton worked with fine enthusiasm until he met his death in the waters of this mighty lake on Oct. 13, 1845. It is to Dr. Douglas Houghton that the credit belongs of discovering the presence of copper in the upper peninsula though he discovered no mines in the commercial sense. The first copper mine, the famous Cliff at Eagle River, was discovered by John Hays of Pittsburg, later of Cleveland, on Nov. 18, 1844, and in a period of ten years from 1846 to 1856 it yielded $3,858,000 upon an original investment of $108,000.

"It is a matter of great historical interest that Dr. Houghton makes no mention of iron in his geological reports. It brings, therefore, the discovery of this important metal within the memory of men now living. Of copper it is impossible to determine who first discovered it. There was a people who antedate the present race of Indians who knew of the existence of copper and had uses for it. Lying about some of the early copper mines were stone hammers; underpinning masses of native copper were wooden props in such a state of decay that centuries must have been required in the process; moreover, out of the thrown-up earth of these early mines trees had grown, had fallen and decayed and grown again, marking the centuries with the rings upon them. Of this crude but industrious race the Indians had no knowledge.

"Iron was first discovered by William A. Burt, United States deputy surveyor, and party, who were engaged in surveying the upper peninsula. While running the east line of township 47 north, range 27 west, they observed, on Sept. 19, 1844, by means of the solar compass, the most remarkable variations in the direction of the needle. Mr. Burt was the inventor of the solar compass, and when the fluctuations indicated a variation of 87 degrees he was tremenduously excited. He directed the members of his party to look around for the presence of minerals. Indeed they found same without effort, a mere rip of the sod revealed the ore. The surveying party duly recorded their discovery in their reports, but they appear not to have mentioned it to anyone who could profit by the discovery. Among those to whom they made mention of the existence of iron was Louis Nolan, a half breed living in this town of Sault Ste. Marie, and also to an old Indian chief, Madjigijig, whose wigwam was at the mouth of the Carp river. In the spring of 1845, P. M. Everett of Jackson, Mich., concluded that he would investigate the reports concerning copper in the Lake Superior region, and undertook the journey, accompanied by four men. He met Louis Nolan at Sault Ste. Marie, who related to him the discovery of the iron deposits by the Burt surveyors and volunteered to show him the way. Everett was therefore the first white man, as far as is known, to hear of iron. He accepted Nolan's offer and employed him as a guide. Nolan took the party to Teal Lake, but was unable to locate the deposits. Everett then abandoned his quest for iron and started for Copper Harbor, but on the journey fell in with the Indian chief Madjigijig, to whom, as fortune would have it, he related the story of their fruitless search. He at once undertook to show them the deposits and piloted them directly to Jackson mountain and then to the Cleveland mountain. I use these terms because it was by these names that the deposits became known later. The actual discovery of the Jackson deposit, which was the first to be pointed out, was made by S. T. Carr and E. S. Rockwell, two members of Everett's party. Owing to Madjigijig's superstitions regarding them the old Indian would not approach the mines directly. The Everett party had a number of permits in their possession issued by the secretary of war to preempt mineral locations, and one of them, made out to James Ganson, was used upon the Jackson location. The party then gathered up a little of the ore and returned to Jackson, Mich., with it. The following spring another expedition was fitted out by Mr. Everett to visit the Jackson location. They built a house upon it and then returned to the mouth of the Carp river with 300 lbs. of ore upon their backs, some remaining behind, however, to keep possession of the location. Everett's party at this time consisted of F. W. Kirtland, E. S. Rockwell, W. H. Munroe and E. V. Berry. It was Berry who journeyed homeward with the ore. At the Sault he met J. Lang Cassels of Cleveland, a noted mineralogist, who had been sent into the peninsula in the interests of a number of Cleveland gentlemen. Berry made known to Cassels the second deposit, and Cassels, taking Berry's canoe, visited the location and secured it by a permit. Berry continued on his journey to the Jackson with his ore, where he made two attempts to smelt it in a cupola furnace and failed. Some of the ore was then taken to Mr. Olds, of Cucush Prairie, who suceeded in making a fine bar of iron of it in a blacksmith's furnace, the first iron ever made from Lake Superior ore. In the spring of 1847 the Jackson company constructed a forge on the Carp river, about three miles from the mine, and on Feb. 10, 1848, the first iron ever made in the Lake Superior region was made in this furnace by Ariel N. Barney. A month later the forge went out of commission, being carried away by a freshet. Mr. Everett returned in the spring of 1848, repaired the dam and resumed the manufacture of blooms. The first iron made was sold to E. B. Ward, who used it in the walking beam of the steamer Ocean. The forge had four fires from each of which a lump was taken every six hours, which was placed under the hammer and forged into blooms 4 inches square and 2 feet in length. The daily product was about six tons, requiring two teams of six horses each to convey the blooms to Marquette, which lay ten miles away. There was a total absence of roads and break-downs were frequent. The same difficulty which attended the getting of the blooms to port was to be met with in getting the ore and charcoal to the forge. After struggling with insufficient power, for sometimes

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the Carp river ran pretty low, with the frightful grades and the abominable roads the forge met its inevitable death. It was abandoned after a fitful career. A third deposit now known as the Lake Superior lay within a couple of miles of the others. Robert J. Graveraet, a man of extraordinary qualities and whom I hold to be a natural leader, believed that he had a claim upon this deposit as well as on the Cleveland mountain. He met at Mackinaw in the spring of 1848, Dr. Edward Clark, of Worcester, Mass., representative of Mr. Waterman A. Fisher, of Worcester, Mass., who had become interested in the accounts of mineral wealth of the region and who had sent Clark to investigate. Clark, like all the others, was after copper, but Graveraet induced him to look at the iron mine. In March, 1849, the Marquette Iron Co. was formed, consisting of W. A. Fisher, A. R. Harlow, Edward Clark and R. J. Graveraet. Graveraet came over to Mackinac Island looking for men to develop the mine. It was during this visit that he met me. I was a boy 19 years old, working on Mackinac Island with Captain Augustus Canfield of the lighthouse service, who was building a crib at the Waugoshance reef. Graveraet succeeded in enlisting the aid of ten of us, and in April, 1849, we set out for the iron mines in the little steamer Tecumseh. At the Sault we transferred our few belongings to a Mackinaw barge, and after eight days of rowing, towing, poling and sailing we reached Carp river and anchored at the Indian town now known as Marquette. It was evening when we approached the river. The first person to greet us was Charlie Bawgam, the son of Shauwano, the last of the Indian tribal chiefs to make his headquarters at the rapids of Sault Ste. Marie. There were two small log houses at the mouth of the Carp river and five or six birch bark wigwams, all inhabited by Indians. Beyond this small clearing was the forest and thicket. Bawgam invited us into his cedar wigwam and his wife, Charlotte, cooked our first supper. The next morning we began our journey to the iron mines, where for a month thereafter we cleared brush and, incidentally, fought black flies by day and mosquitoes by night. Samuel Moody and John H. Mann were preempting a deposit for the Marquette Iron Co., though the prior right of the Cleveland company to this deposit was subsequently substantiated. Dr. Edmund C. Rogers was preempting the Lake Superior deposit for Graveraet. About a month later, or to be exact, on June 10, 1849, we went down to the shore of the lake to welcome Harlow and his party from Worcester, because we calculated that by that time he would have arrived with the machinery for the forge which we intended to build. In fact they had reached Marquette on the day before on the schooner Algonquin from the Sault. Capt. John McKay, master of the Algonquin, had previously decided that Iron Bay, now Marquette, was no place for a schooner to be during an east wind. The prevailing opinion of all navigators was that Iron Bay was full of sunken rocks. He accordingly landed his passengers on the eastern shore above little Presque Isle. They were about thirty-five in number and had a large amount of baggage, including trunks and tool chests, which was all dumped along the beach. They were compelled to stay there over night without bedding and were a sadly bedraggled and uncomfortable lot when they reached Marquette the following afternoon.

"For the next month we were busily engaged in founding the present city of Marquette. We intended to call it Worcester, in honor of Mr. Harlow, but it was later named after the famous Jesuit priest, who now sleeps at St. Ignace.

"The first thing we did was to build a dock. We were a month at it, making it out of the front of solid rock and piling trees lengthwise and crosswise until the structure thus created was even with the surface of the water. Then we wheeled sand and gravel upon it, and by the end of the third week it seemed both capacious and substantial. The surface was then corduroyed and it was ready for the reception of freight. One morning of the fourth week on going down to the beach I was surprised to discover that the dock had entirely disappeared. Not a trace of it remained. The sand was as clean and as smooth and as packed as it had been for centuries before. The first storm had carried the structure completely away. It was a long time before anyone had the hardihood to attempt to build another dock.

"Methods were indeed primitive with us. Boilers were plugged and thrown overboard and other machinery was landed by the Mackinaw barge. Cattle and horses were invariably pitched overboard to swim ashore. Passengers and perishable freight were landed with small boats.

"The Marquette Iron Co. established its forge in 1849, the second to be established in the region. In the fall of 1850 the preemptors gathered in this town of Sault Ste. Marie, where a land office was established, to prove their claims to iron deposits. Samuel Moody and Dr. Rogers had left Marquette in a sailboat for the Sault, the former to claim the Cleveland deposit and the latter to claim the Lake Superior location. They were becalmed and did not reach the Sault on the appointed day. The Cleveland deposit passed to the Cleveland company without contest, as it had its representative present and proved that it had not allowed its claim to lapse since Dr. Cassels had visited it in 1846. The Lake Superior location was claimed by Isaiah Briggs, who secured it on behalf of John Burt, son of Wm. A. Burt. Briggs was a packer of provisions for the surveying parties and had built a little shanty for himself and his pony on the Lake Superior location, which he used as a basis of supplies. On the strength of this residence he secured the claim for Burt. Burt subsequently gave to Graveraet an undivided one-half interest in this deposit, which he assigned to the Marquette Iron Co.

"It was during the winter of 1850 that ore was first hauled from the Cleveland mine. The ore had been made during the preceding summer and put into the stock pile to await the winter's haul. Owing to the abominable condition of the roads it was impossible to haul ore in the summer time. The Cleveland mine lay two miles beyond the Jackson mine, and the distance was regarded as considerable in those days and was the reason why no ore had been hauled previously from that mine. During the preceding winter of 1849 the snows had been so heavy that no attempt was made to haul ore from the Cleveland mine. The little quantity that was hauled from the Jackson mine during the winter of 1849 was speedily consumed and the forge had to suspend operations during the summer for want of ore. Another great difficulty was the impossibility of keeping a sufficient supply of charcoal on hand to keep the forge running. The charcoal in those days was all burned or charred in pits. Such a thing as a charcoal kiln of brick or stone was unknown. The deposits, fortunately, needed no such appliances as drills or powder to work them. If they had they probably would not have been worked as there were neither drills nor powder in the peninsula. Nature, by frost or some other means, had loosened up thousands of tons of as pure ore as was ever mined, so that any common laborer had only to pick it up in his hands and carry it to the stock pile. During the winter of 1850 about twenty-five double teams were employed in hauling the

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ore to the forge at the lake, where it was crushed and then made into bloom iron ready for shipment. This venture of making blooms was most disastrous. The cost of getting the ore to the lake, the cost of the charcoal, the unloading at Sault Ste. Marie, the portage over the falls, the loading again upon small vessels, made the actual cost of the blooms so excessive that it was impossible to win a profit from their manufacture. By the time the blooms were laid down at Pittsburg they had cost altogether about $200 per ton, while the market price for iron at that time was about $70 a ton.

"As I have said, ore was hauled in sleighs in the winter time only. The average sleigh load was a gross ton, and it was impossible for a team to make more than one trip a day. A stock pile over winter therefore, of 1,000 tons on dock was a considerable amount. I remember in 1852, having shipped six barrels of ore on the sidewheel steamer Baltimore consigned to B. L. Webb, Detroit, who was at that time secretary of the Jackson Iron Co. The Baltimore was a passenger steamer and the only way she would carry ore was to put it in barrels. In 1853 the assets of the Marquette Iron Co. passed to the Cleveland Mining Co. The Cleveland company was quite generous indeed. It reimbursed the Marquette Iron Co. for all improvements that had been made, and as I was at that time keeping store for the Marquette Iron Co. I was included among its assets and transferred to the Cleveland Iron Mining Co. The forge of the Marquette Iron Co., which had run so disastrous a career financially, was abandoned.

"The Cleveland and Jackson companies began the construction of a plank road to the mines, but in 1853, after the successful test of a few tons of ore in a blast furnace at Sharon, Pa., they determined to convert the plank road into a strap railroad, and rails for that purpose were sent up from Sharon. Meanwhile congress had authorized Michigan to give 750,000 acres of land to any company that would undertake to construct a canal around the rapids of Sault Ste. Marie. Work was begun upon the canal in 1853 and was finished in 1855, water being let into it on April 19, the sidewheel steamer Illinois passing upward on June 18 following, and the sidewheel steamer Baltimore passing downward immediately thereafter on the same day. The first shipment of ore through the canal was on the brig Columbia, on Aug. 17, 1855, and was forwarded by the Cleveland Iron Mining Co. and also consigned to the Cleveland Iron Mining Co. at Cleveland. In all 1,449 tons were shipped through the canal that year, constituting the total shipments of the peninsula. All this ore was shipped by the Cleveland Iron Mining Co., as the Jackson and Lake Superior companies were not prepared to ship any at all.

Meanwhile the iron companies were bending every effort to get their strap railroad finished to the mines. It was not until November, 1885, however, that it was finished, or three or four months after the canal was in operation. This old strap railroad lived what President Roosevelt would call "a strenuous life" for two years. The motive power was mules, and the cars held about four tons each. The cars were flat bottom and a team could not make more than one trip a day—sometimes not that—and for the entire motive power to move thirty-five tons a day from the mines to the lake was regarded as a big day's work. The grades were simply frightful and the cars frequently ran away, mangling the mules and jumping the track at the first curve. The demand for the ore was growing beyond the capacity of animal power to haul it, and the Cleveland and Jackson companies realized that the strap railroad would never do. Heman B. Ely had begun the construction of a steam railroad to the mines, and when congress passed the land grant in 1856 to stimulate the construction of railways, overtures were made for consolidation with Ely's steam railroad.

Ely's steam railroad to the mines was finished in September, 1857. The first locomotive used upon it was the Sebastapol, which was carried up the lakes on the brig Columbia. The second locomotive was named C. Donkersley, which was brought up on the schooner E. C. Roberts. Both these locomotives were built by the New Jersey Machine & Locomotive works, Paterson, N. J.

With this motive power it was possible to move 1,200 tons per day. The little dock at Marquette was a flat structure without trestle work, and the ore was put aboard steamers by means of the gangplank and wheelbarrow. All ore was practically carried in sailing vessels as the steamers of those days were passenger boats and had practically no means of carrying ore without making a dreadful litter upon the deck. It was not for some years thereafter that anyone thought of building steamers exclusively for the ore trade. The common opinion was that iron, being a low priced material, would always be carried principally in sailing vessels, which it was supposed would always remain the cheapest mode of transit.

"I have gone thus intimately into the development of the early iron mines because it is a truthful recital of the actual beginning of that industry which has grown to be the most important in the United States, certainly the one which has distributed the blessing of prosperity more widely among the people of the United States than any other industry, more widely indeed than it is distributed among the other nations of the earth. These early companies were of heroic mould, for they suffered untold hardships and privations and it was fifteen years after they begun operations before they were enabled to declare their first dividend.

"It might be well to give a picture of the situation as it existed on Lake Superior prior to the canal. You must remember that we were shut off from the world for six months during the year. As soon as the lakes froze, communication with civilization as it was then known was impossible. To those of you who have never experienced the sensation of being shut off from the rest of the world it is probably impossible to convey the anguish that one feels in the suspension of mail delivery. No facilities obtained for the delivery of mail for the little colony at Marquette and the iron mines during the winter. Nearly every inhabitant of the peninsula was there as an adventurer. His home was somewhere down below where he had left his family. To see the winter set inexorably in with no prospect of further communication until spring was insupportable. No man knew what was happening to those who were dearest to him and everyone was consequently discontented and restless. On several occasions I was deputized as mail carrier and carried the outgoing mail by means of Indian guides, dogs and sleds overland from Marquette to Escanaba, bringing the mail for the iron country back with me. Several of these journeys were made. During one winter I made nine trips, establishing a station at L'Anse, where I might meet another carrier. This station was as primitive as it well could be, the mail bag simply being hung on the limb of a tree, where the relay might get it. The sled was flat like a toboggan and the dogs were mongrels, stout curs capable of making four or five miles an hour.

"We have but to look about us now to see a maritime panorama such as the greatest harbors in the world can scarcely rival. It does not need my assurance that it was not always thus. Indeed, fifty years ago this spring there were scarcely a dozen vessels on Lake Superior.

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They could all of them be very comfortably stowed in the hold of any one of the steamers that are lying on either side of these locks today. It is but a trifle more than fifty years ago since a little schooner of eighty tons, the Swallow, was considered too large for the commerce of Lake Superior and was accordingly sent to the lower lakes. As it is a very simple thing to do I may as well recount the total tonnage of Lake Superior prior to the construction of the Sault Ste. Marie canal. It appears that a Frenchman named Laronde built a bark of forty tons above the St. Mary's Falls about 1731, the rigging and other material being sent from lower Canada in canoes. It is stated by Captain Jonathan Carver, who traversed Lake Superior in 1766, that the French while in possession of Canada kept a small schooner on Lake Superior. The loss of this vessel is reported soon after the conquest of Canada by the British. The discovery of copper led to the building of a sloop of forty tons by Alexander Henry and his comrades, as I have already mentioned. It probably passed into the hands of the fur traders after the collapse of their mining enterprise. For many years thereafter the waters of this mighty lake knew nothing but the birch bark canoe and the batteaux of the voyageurs of the Hudson Bay Co. The early history of the commerce of Lake Superior cannot be understood without reference to the remarkable commercial organizations formed to deal in furs. The first and most important was the Hudson Bay Co., which was chartered by Charles II. in 1670. It had exclusive right to trade in and govern all the territory draining into the Hudson Bay. For more than a century it exercised these privileges without opposition. In 1783, the year when the independence of the United States was acknowledged by treaty, the Northwest company was organized at Montreal and became a competitor of the Hudson Bay Co. Its success stimulated the formation of other companies, among them the American Fur company, organized by John Jacob Astor. In 1821 the Hudson Bay Co. and the Northwest Co. were amalgamated under the name of the former. At the beginning of the war of 1812 the Northwest company reported to the Canadian government that it would place at its disposal on Lake Superior a vessel of 120 tons which could carry eight guns, and another of 60 tons. These and three others were captured by the Americans. A fourth hid in one of the little harbors on Isle Royal, escaped detection, and at the end of the war was run down the St. Mary's rapids for service on Lake Erie. At the close of the war congress passed an act prohibiting British fur traders from prosecuting their enterprises within the territory of the United States. This gave the American Fur Co. its opportunity, and before many years had elapsed it had sailing vessels both above and below the St. Mary's Rapids. It is not certain that the British company again placed vessels on Lake Superior. The British, however, were not entirely driven from Lake Superior. They had a steamer in service in 1822 and 1823 on which Lieutenant Bayfield of the Royal navy made a survey of the lake. This schooner was probably the Mink, furnished him by the Hudson Bay Co. Considering the means at hand Bayfield's work was wonderfully well done. The shore line, depths of water, sunken rocks, etc., were represented with surprising detail, and Bayfield's charts remained standard for fifty years.

Previous to 1829 the fur companies had in their employ on Lake Superior the following vessels: Invincible, Otter, Mink, Recovery and Discovery. They were schooners varying in size from twenty to one hundred tons burden and were all built on Lake Superior. The Invincible was wrecked on White Fish Point about the year 1822. The Discovery went to pieces in running the rapids at the Sault. The Mink went ashore on the Canadian side above the rapids and was entombed there. The Recovery safely ran the rapids in 1829 and was purchased by Merwin & Giddings of Cleveland and ended her days on Lake Erie. The fate of the Otter is unknown.

"During the six years that followed 1829 the only vessels that navigated Lake Superior were batteaux and birch-bark canoes.

"In 1835 George W. Jones built above the Sault a schooner of 113 tons and named her the John Jacob Astor. She made her first voyage in August of that year under command of John A. Stannard, who upon that very trip at 4 p. m. on Aug. 26, discovered the celebrated rock which bears his name. The Astor was wrecked at Copper Harbor, Sept. 20, 1844. The schooner William Brewster, named after the agent of the American Fur Co. at Detroit, was built for that company above the rapids in 1848. Her career on Lake Superior lasted only four years when she ran the rapids and ended her days on the lower lakes. The schooner Algonquin, built at Cleveland by Richardson & Mendenhall, was hauled over the portage at Sault Ste. Marie in 1839 and made her first trip on Lake Superior in 1840. She was the first vessel to be hauled over the rapids into Lake Superior, though the more important vessels to sail Lake Superior thereafter until the canal was opened came upon the lake in that same manner. It is of historical moment that after the Astor was wrecked at Copper Harbor in the fall of 1844, this little schooner Algonquin cared for the entire commerce of Lake Superior alone during the greater part of the year 1845. The Algonquin sank in the bullrushes near the present city of Duluth in 1856, though there was no Duluth then. Her hull is still visible there, though her upper works were long ago removed.

"The schooner Madeline, belonging to the American Fur Co. was built at La Pointe in 1839 and was wrecked at Isle Royal the same year. The schooner Siscowit was later built by the American Fur Co. She went to pieces in trying to make Chocolay harbor in the winter of 1849. This practically embraced the list of vessels on Lake Superior until 1845, when the growing commerce caused by the copper excitement made it necessary to increase the tonnage. It was found more convenient to haul the vessels over the portage than to actually build them on Lake Superior. During that year the following vessels were hauled over: Schooner Chippewa, 20 tons; schooner Florence, 20 tons; schooner Swallow 80 tons; schooner Merchant; and the propeller Independence, the first steamer ever to sail the waters of Lake Superior. The Independence came to an abrupt end by the bursting of her boilers about a mile above the rapids in 1853.

"The schooner Napoleon was built at the Sault in the summer of 1845 and was changed into a propeller in the winter of 1848-49. After the canal was completed she ended her days doing lighterage work on the St. Clair river, helping vessels over shoals. The schooner Uncle Tom was put over the portage in 1857. The first side wheel steamer to sail the waters of Lake Superior was the Julia Palmer, which was hauled over the portage in 1846. Her career lasted only one season. Upon her return to Sault Ste. Marie in the fall her machinery was taken out of her and she was towed to Wyascia bay and used as a wood dock. The schooner Geo. W. Ford was hauled over in 1850. The propeller Manhattan was taken over in 1850, and Lake Superior was then blessed with a staunch and excellent vessel. In 1851 the propeller Monticello was taken over the portage by Sheldon McKnight

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to compete with the Manhattan. A war of rates was pursued and the feeling between the two lines was very bitter. Three months later a collision occurred between the Monticello and the Manhattan. This affair has never been satisfactorily explained, though it was the general opinion at the time that it could have been avoided. The Manhattan was cut down and sunk near Grand Island, but was raised and placed in commission again within six weeks. The Monticello stood by and cared for her passengers so that no lives were lost. A few weeks later the Monticello after coming out of Ontonagon was found to be taking water rapidly. Finally her fires were put out by the water rising to her furnaces and she went upon the rocky shore about twenty miles above Eagle river and pounded to pieces. She had undoubtedly been cracked from stem to stern in the collision, but during her brief life she was the star vessel on Lake Superior. The Manhattan was wrecked in trying to enter Grand Marais harbor in 1858.

"The hauling of vessels over the rapids continued. The fine sidewheel steamer Baltimore was hauled over by the McKnight line in 1852. The propeller Peninsula was put over by the McKnight line in 1853. The sidewheel steamer Sam Ward was also put over by Captain Eber Ward in 1853. The Ward was the last vessel to be launched in this manner on Lake Superior, as actual work on the canal had then been begun.

"Probably a few words about Sault Ste. Marie may not be amiss. I am bound to Sault Ste. Marie by ties of great affection because I believe that in my younger days I extracted more genuine pleasure from this little settlement than from anything else that came into my life. There was always some sort of human life at Sault Ste. Marie. When Nicolet came here in 1634 he found a permanent Indian town here. By these rapids, which are always open, the Indian could continuously fish and was sure, at any rate, of one source of food supply. Elsewhere they are nomadic. It is related that in 1641 Charles Raymbault and Isaac Joques held a brief mission at the rapids and called it St. Mary. In 1661 Radisson and Grosseilliers camped here for a little while, but the permanent settlement of Sault Ste. Marie is to be dated from the establishment of the mission by Father James Marquette in 1668. Sault Ste. Marie is the oldest town in Michigan, antedating Detroit by more than thirty years. In 1750 the French established a military post at Sault Ste. Marie, but when Alexander Hendry visited the place in 1772 he found it already in a state of abandonment, the French having evacuated it in 1760 after the surrender of Canada to Britain. Alexander Hendry said that the town at that time consisted of four houses. John Johnston, an Irishman of noble birth, settled here in 1792, and in 1793 he married the daughter of Waubajeeg, the chief of the Chippewa tribe of Indians. Johnston built a splendid and elegant home on the banks of the river in a beautiful old-fashioned garden, and here he reared as interesting a family as could be found on the continent. He took especial delight in educating his children, spending several years abroad with one of his daughters completing her education. This daughter, Jane, subsequently married Henry R. Schoolcraft, the historian and writer, upon whose Ojibway legends Longfellow founded his beautiful poem of Hiawatha. Mrs. Johnston, though a native of our wilds, had excellent qualities of heart and mind and for thirty-six years presided over the leading home of Sault Ste. Marie.

"In 1837 it is recorded that there were three merchants at the Sault and that one Indian was taxed. By 1845 the influx of miners into the copper country had grown so large that it became necessary to establish two hotels at Sault Ste. Marie. One was known as the Van Ander house and the other as St. Mary's hotel. Up to that time the line of communication to the Sault consisted principally of the steamer Detroit, which made one trip a week from Sault Ste. Marie to Detroit. In 1846 one or two additional vessels were put on. The incoming prospectors found a curiously interesting little colony at the Sault, consisting of about two hundred persons of all nations and colors. The Indian population found its main aim in life to consist of hunting and chopping wood to supply the garrison and traders with fuel. In the spring they made sugar and fished. In the summer they made hay for household use in making beds as well as feeding stock. In October and November they laid in the winter's supply of fish, which they cured by drying and smoking. In the winter they caught fish through the ice by means of spears, for as a rule the Indians were improvident and lived from hand to mouth. The Indians divided the year, as indicated, into four seasons, and at the beginning of each season secured an outfit for himself and family from the traders. It must be admitted that the prices which the traders charged the Indians were exorbitant, but if the traders ever had any conscience on this score it was quieted by the habit of the Indian in maintaining that he had wiped out all the indebtedness against him when he turned over the result of his season's efforts to the trader, and he would never thereafter acknowledge any indebtedness whatever for his outfit.

"Life at the Sault before the canal was picturesque, romantic and dreamlike. Time forbids, however, that I should dwell further upon it.

"It was in 1865 that the Peninsula Railroad, projected mainly through the efforts of Mr. Charles T. Harvey, who built the first canal at the Sault, was extended from Escanaba on Green bay to the iron mines at Ishpeming and Negaunee, a distance of sixty-two miles, thus forming another outlet for the ore of the Marquette range. The growth of the ore trade, however, was slow, and for many years lumber continued to be the important trade of the lakes. It was in 1869 that the first steamer designed for ore carrying purposes exclusively was built. This was the steamer R. J. Hackett, which was built to carry the ore of the Jackson mine. The following year the Forest City was built as her consort. Prior to that time ore had been carried principally in sailing vessels and towing had become a profitable business in the rivers. First of all sailing vessels were lashed alongside of the little propellers and towed through the rivers, as is the common practice in the coast ports today. Later, however, astern towing was found more convenient and it was common to see seven or eight sailing vessels towing behind one steamer. The propeller and its consort, however, proved handier, and in the 70's displaced altogether the system of towing through the rivers. Gradually the sailing vessels which had been living an independent existence became consorts to steamers themselves.

"In 1877 the Menominee range was opened and by 1879 had become an important contributor to the stream of ore going down the lakes. The problem of loading the ore had been solved by means of pockets and chutes in the ore docks, but the problem of unloading it was a severe matter. The first ore was unloaded in tubs by means of a horse, block and tackle. The horse by walking forward hoisted the tubs out of the hold, where it was dumped into barrels and wheeled ashore. In order to get the tub into the hold again it was necessary for the horse to back up. It took two days to unload a cargo of 400 tons by this means. In 1867 Robert Wallace in-

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stalled on the docks at Cleveland a little portable engine to take the place of the horse, and in this manner secured increased dispatch. Shipments of ore were annually increasing, however, and it became absolutely necessary if the business was to be handled at all that an improved method of unloading must be devised. Fayette Brown had spent a great many years on the Marquette range, and his son, Alexander E. Brown, a young man of great mechanical ingenuity, directed his attention to this problem with the result that in 1880 he devised a system of hoisting and conveying by machinery that has now reached a state of great efficiency. By this system great speed was secured in hoisting the ore out of the vessel and in conveying it to the cars or to the stock pile, but the tubs had still to be filled by hand. However, by working at every hatch simultaneously a vessel could be unloaded with reasonable dispatch.

"In 1884 the Gogebic range made its first shipment and shortly thereafter in the same year the Duluth & Iron Range Railway was completed to the Minnesota mine on the Vermilion range, bringing this great ore body into the market. Six years later the Mesabi, the world's unrivaled ore deposit, was discovered, and in 1892 began shipments. Though only twelve years old, Mesabi's shipments now exceed those of any range, having passed the total shipments of the Marquette range last year. This torrent—deluge of ore—one might say, then beginning to course down the lakes rendered imperative greater facilities in transit and in handling. That necessity is the mother of invention has never been better exemplified anywhere than on the lakes. Sudden as has the expansion of the ore trade been—more than one-third of the total movement being the work of the past five years and more than three-fourths of the total movement the work of the past ten years—vessel tonnage and dock equipment have both expanded to care for it with ease This is a remarkable achievement in a trade subject to such violent disturbances as is the iron trade and where the movement of ore may fluctuate between wide latitudes, increasing from 1,000,000 tons one month to 5,000,000 the next. A system that will accommodate itself with ease to such a trade as this is remarkable, but such a system exists on the lakes. The vessels of the great lakes have grown until they now rival in dimensions the ocean liners. Arched girders have taken the place of stringers and stanchions, so that the hold is entirely uninterrupted and no part of the vessel's structure interferes with the operation of the unloading machine.

"I have already stated that the fact which militated against high unloading speed was that the tubs had still to be filled by hand. This problem has now been solved by the invention of an automatic bucket which fills itself in any grade of ore. These buckets lift ten tons of ore at one time and by their use vessels carrying over 10,000 tons of ore have been unloaded in a little over four hours' time.

"Freight rates on the lakes were a sort of a jumping jack in the early days, but they are now becoming as stable as rail rates. I remember that in the fall of 1866, $6.50 was paid to freight ore down the lakes, and in November, 1871, it went to $7.00. Now the contract rate is 75 cents from the head of the lakes, with a wild rate that scarcely varies from that figure.

"I have told you that in the early days they started to make pig iron in the peninsula. Everyone thought that that was the proper thing to do until they discovered that it wasn't. We could make about six tons a day in our little forges and lose a great many dollars on every ton. The first pig iron produced in the Lake Superior region was made in 1858 by Stephen R. Gay, who leased the forge of the Collins Iron Co., which was the third forge to be established in the peninsula, and converted it into an experimental miniature blast furnace. The first blast furnace in the Lake Superior country was built in 1858 by the Lake Superior Iron Co. of Negaunee. It was called the Pioneer furnace. About twenty-five furnaces were started in the next ten years, thirteen of which were in operation at the end of the decade, but only one of them now survives, the Pioneer, which was transferred a few years ago to Gladstone. The time was not ripe then for iron making in the peninsula. There was no consuming population within its natural market. This condition is now being gradually changed, however, as the northwest is becoming populated. Lake Superior ores, however, are fully three-quarters of all the ores mined in the United States, and this year fully 80 percent of the pig iron metal that is made in this country will be made out of Lake Superior ore. The iron trade of the United States practically had its birth with the discovery of the Marquette range. It has been reinforced steadily by the discovery of other ranges until it now rests upon the firm basis of Mesabi, the most abundant and the easiest mined high grade ore in the world. In 1855, the year in which it became commercially possible to ship Lake Superior ore, the United States produced 700,159 tons of pig iron, as against 3,218,154 tons by Great Britain. By 1869, by which time Lake Superior ore was moving freely, the United States produced 1,711,287 gross tons of ore as against 5,445,757 tons in Great Britain and 1,409,429 in Germany. The encroachment upon the British lead by reason of the profusion, quality and ease of transit of Lake Superior ore by the United States has been steady until in 1890 we find the United States passing Great Britain by making 9,202,703 tons of pig iron against 7,904,214 tons in Great Britain, and 4,641,217 tons in Germany. In 1903 the pig iron production in America reached its high water mark, making 18,009,252 tons against 8,935,063 tons in Great Britain, or more than once again as much as Britain. Germany during 1903 made 10,085,634 tons of pig iron. The present year of 1905 is, however, expected to be the record-breaking year of all, when more than 30,000,000 tons of Lake Superior ore will come down the lakes, and when the furnaces of the United States will, according to the monthly rate of the present year, safely make more pig iron than Great Britain, Germany and France combined. One single company alone, the United States Steel Corporation, produced last year more steel than was made in the whole of Great Britain. The steel output of the Steel Corporation last year was 8,406,378 tons, against 5,134,102 tons, exclusive of castings produced in Great Britain.

"Upon these Lake Superior hills, indeed, lies the great supremacy of the United States in the making of iron and steel."

OBITUARY

Capt. Alexander McPhail, one of Lorain's pioneers and an old lake captain, died at his home at Amherst Junction last week. He was seventy-five years old and had commanded vessels for nearly forty years.

The Pacific Coast Steamship Co.'s freighter Montara arrived at San Francisco from Copper Island and other Russian ports early in July. Her freight occupied only a few staterooms but is valued at $300,000.00. She carried supplies to the stations of the Kamchatka Commercial Co. and brought back the following skins: 3,529 sables, 1,002 red foxes, 65 cross foxes, 479 bears, 127 land otters, 9 wolves, 23 wolverines, 47 white foxes, 69 ermines, 141 sea otters, 48 blue foxes and 478 seals.

Seamen on Canadian vessels are demanding an increase in wages of about 50 cents a day. Canadian vessel owners feel they cannot afford to pay the advance with freight rates at their present basis.

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WHAT OF OUR COMMERCE?

By Lewis M. Haupt.

In an address before the Board of Trade of Tonawanda, William A. Livingston called attention to the rapid increase in the dimensions of the lake carriers and sounded a note of warning as to their continued expansion. But a few years ago the 3,000-ton propeller was the exception. Now one of 10,000 tons scarcely attracts attention and it is an accepted fact that the larger the vessel the cheaper the unit-cost of operation.

But the dimensions are limited by the available depth of the channel and this can only be increased by lowering the bottom or raising the surface of the lakes by dams, as has been so intelligently advocated by many of the experienced lake survey assistants.

By a dam in the Niagara river the general surface of Lake Erie may be elevated several feet and the discharge through the Detroit river, being thus checked by back water, there would be a sensible deepening over the Lime Kiln crossing and an elevation in Lake St. Clair also. The general objection to this plan has been urged from the easterly end of the lake, where the oscillations from great storms cause a fluctuation of eight feet and over in rare instances.

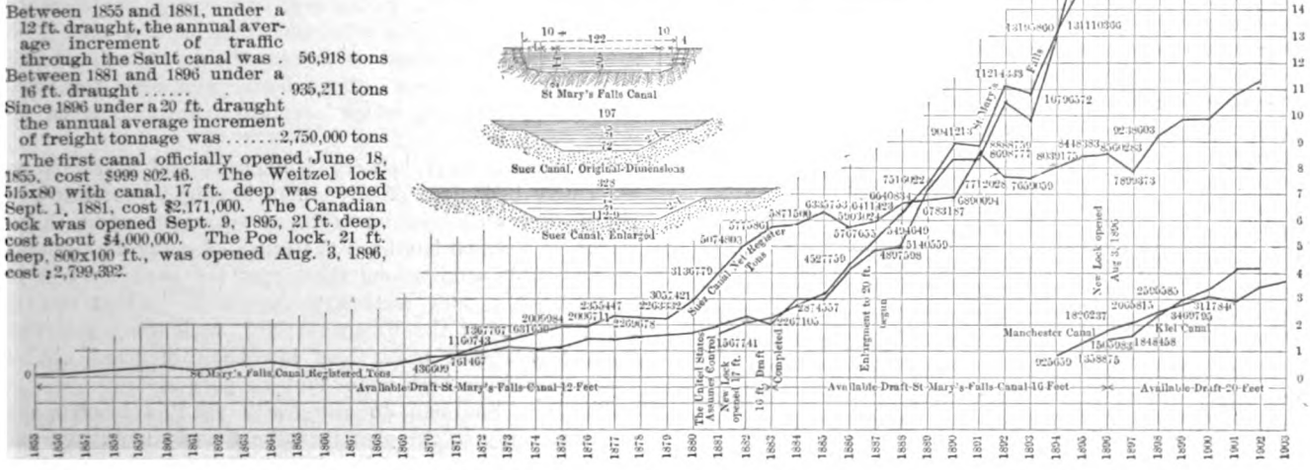
It would seem, therefore, that a general raising of the lake surface would be the better method of securing deep-

Graphic comparison of the Commerce through St. Mary's Falls Canal and that of the Suez Canal. Showing increase due to enlargements.

Calendar Year.	Registered Vessels		Suez	St. Mary's Falls Canal.		Percentage	
	Suez	St. Mary's	Net Register	Registered Tons	Freight Tons	Increase	Decrease
1855	.....	.....	.....	106,296	(of 2,000 lbs.)	....	....
1856	.....	.....	.....	101,458	.....	....	....
1857	.....	.....	.....	180,820	.....	....	....
1858	.....	.....	.....	219,819	.....	....	....
1859	.....	.....	.....	352,642	.....	....	....
1860	.....	.....	.....	403,657	.....	....	....
1861	.....	.....	.....	276,639	.....	....	....
1862	.....	.....	.....	359,612	.....	....	....
1863	.....	.....	.....	507,434	.....	....	....
1864	.....	.....	.....	571,438	.....	....	....
1865	.....	.....	.....	409,062	.....	....	....
1866	.....	.....	....	458,530	....	....	....
1867	.....	.....	.....	556,899	.....	....	....
1868	.....	.....	.....	432,563	.....	....	....
1869	.....	.....	.....	524,885	.....	....	....
1870	486	1,828	436,009	690,826	.....	....	....
1871	765	1,637	761,467	752,101	.....	....	....
1872	1,082	2,004	1,160,743	914,735	.....	....	....
1873	1,173	2,517	1,367,767	1,204,446	.....	....	....
1874	1,264	1,734	1,631,650	1,070,857	.....	....	....
1875	1,494	2,033	2,009,984	1,259,534	.....	....	....
1876	1,457	2,417	2,006 771	1,541,676	.....	....	....
1877	1,603	2,451	2,355,447	1,439,216	.....	....	....
1878	1,593	2,567	2,269,678	1,667,136	.....	....	....
1879	1,477	3,011	2,263,332	1,677,071	.....	....	....
1880	2,026	3,453	3,057,421	1,734,890	.....	....	....
1881	2,727	3,823	4,136,779	2,092,757	1,567,741	....	....
1882	3 198	4,402	5,074,808	2,468,088	2 029.521	29 4	....
1883	3.307	4,078	5,775,861	2.042.259	2,267.105	11 2	....
1884	3,280	5,318	5,871,500	2.997,837	2 874,557	26.7	....
1885	3,620	5,043	6,335,753	3,035,137	3 256,628	13 2	....
1886	3,100	7,118	5,767,655	4,219.397	4,527,759	39 0	....
1887	3,137	9,355	5,903,024	4,897,598	5,494,649	21 3	....
1888	3,440	7,803	6,640,834	5,130,559	6,411.423	16 6	....
1889	3,425	9,579	6,783.187	7,221,935	7,516,022	17 2	....
1890	3.389	10,557	6,890,094	8,454,435	9,041.213	20 2	....
1891	4.207	10,191	8,698,777	8,400,685	8,888.750	....	1,74
1892	3,550	12,580	7,712,028	10 647,203	11,214,333	26 1	....
1893	3.341	12,008	7,659,059	9,849.754	10,796.572	....	3 87
1894	3,352	14.491	8,039,175	13,110,366	13 195,860	22 2	....
1895	3.434	17,956	8,448,383	16,806,781	15.062,580	14 1	....
1896	3,409	18,615	8,560,283	17,249,418	16,239,061	7.81	....
1897	.....	17,171	7,899,373	17,619,933	18,982,755	16.7	....
1898	3,503	17,771	9.238,603	18,622,754	21,234,664	11.9	....
1899	3,607	20,255	9,893,022	21,958,347	25,255,810	19.0	....
1900	3,441	19,495	9,738,192	22,315,834	25,643,073	....	....
1901	3,699	20,041	10,823.840	24,626,976	28,403,065	....	....
1902	3,708	22,659	11,248,413	31,955,582	35,961,146	....	....
1903	3,761	18,596	11,907,288	27,736,444	34.674,437	....	....
1904	4.237	16,120	13,401,835	24,364,138	31,546,106	....	....

Between 1855 and 1881, under a 12 ft. draught, the annual average increment of traffic through the Sault canal was . 56,918 tons
Between 1881 and 1896 under a 16 ft. draught ..... 935,211 tons
Since 1896 under a 20 ft. draught the annual average increment of freight tonnage was .....2,750,000 tons

The first canal officially opened June 18, 1855, cost $999 802.46. The Weitzel lock 515x80 with canal, 17 ft. deep was opened Sept. 1, 1881, cost $2,171,000. The Canadian lock was opened Sept. 9, 1895, 21 ft. deep, cost about $4,000,000. The Poe lock, 21 ft. deep, 800x100 ft., was opened Aug. 3, 1896, cost $2,799,392.



Extract from Report of Gen. O. M. Poe.

"For thirty-five years I have watched the increase of the great lakes commerce, but neither I nor anyone else has been able to expand in ideas at the same rate. The wildest expectations of one year seem absurdly tame by the side of the actual facts of the next." January, 1891.

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er channels, provided regulating works be placed in the dam to prevent excessive high water and injury to riparian lands.

The magical effects which have actually followed the creation of the larger channels is better shown by the record of the Sault traffic than by that of any other work, perhaps, in the world.

Here, as will be seen, the growth of the traffic on the original draught of 12 ft., which existed from the opening of the canal, in 1855, up to 1881, the average annual increment in the tonnage was only 56,918 tons.

After the opening of the Weitzel lock, with its 16 ft. draught, which was available from 1881 to 1896, the increment each year, sprung to 935,211 tons and subsequently, upon the completion of the Poe lock, in 1896, giving a 20-ft. draught the increment expanded to 2,750,000, up to the close of the century. It has not yet reached a maximum but is continuing to grow with leaps and bounds so that there is great need for further consideration of enlarging the capacity of the channels to render possible the greater economies in water transportation.

As evidence of the great utility of these public expenditures and their efficiency in promoting the general welfare of the country, it may be well to recall the statement made by the vice president, Senator Frye, in connection with one of his reports accompanying the river and harbor bill, some years ago, when he said, referring to the commerce of the Great Lakes:

"No other distinctive type of commerce has contributed more to our industrial development. It has created a means of transportation costing today only one-ninth the cost of the same service by rail. . . . The ton-mileage of the lake marine for 1890 was 18,849,681,384 ton-miles, or about 27.5 percent of all the railroads of the United States. At the average rail rate say of nine mills, it would have cost $169,647,132; but at the lake rate of 1.2 mills it was approximately $22,619,617, or a saving of $147,027,514. . . . The total expenditure for the water improvements of the lakes has amounted to about $30,000,000, or approximately one-fifth of the annual saving effected in transportation. . . . Our waterways have acted as the most powerful regulator of rates. . . . When it is considered that the diminution of the freight charges of one mill per ton in the railroads of the country effects a saving of nearly $100,000,000 to the shippers in transportation, the value of this restrictive power cannot be overestimated."

These are startling facts and leave no doubt as to the wisdom of improving our waterways to their utmost capacity and yet, notwithstanding so palpable a truth, whenever there is an apparent necessity for retrenchment in the public expenses, this is the item which is the first to suffer. Especially has it been so since the demands for much deeper channels have forced themselves to the front, to meet the necessities of the large ports and the heavy charges for maintenance, now approaching in the aggregate some $500,000,000; so that the numerous smaller ports and channels are in great danger of being shunted aside for many years, simply because they have no commerce to justify appropriations, and there is no commerce because of the bars which they are not permitted under our system of "exclusive jurisdiction" from removing at their own cost and risk and under their own plans.

If all accounts be true it would seem that the present depleted condition of the treasury will be again made an excuse for throttling our internal commerce by the failure to make an appropriation for the extension of the deep channels and ports and that the embargo placed on interstate commerce by contracted canals and other limited water courses and by toll-gates charging exorbitant rates, will continue for many years to come.

Instead of expending over 70 percent of the public funds for the pension, war and navy establishments and only about 30 percent for the peace establishment for the administration of this vast domain, it would appear to be wise statecraft to rearrange the apportionment so as to devote a much larger percentage to those public works which are found by experience to net so enormous a return to all parties for the outlay. This would be greatly increased also if the common roads of the country received a fair prorata of public aid as fundamental links in the internal movements of our commerce and as feeders both to the railroads and waterways. Then would the country know the meaning of peace and prosperity, such as it has never known before. The farmers are knocking at the doors of congress for this class of improvements and demanding early relief. Where is our merchant marine, which demands so large a sum for defense? "Ask of the winds which far away, with fragments strewed the sea."

BALTIMORE & OHIO IMPROVEMENTS

The contract for the construction of a little over three miles of new track on the main line of the Baltimore & Ohio railroad between Hollofields and Alberton, a short distance west of Ellicott City, Md., has been awarded to Messrs. Thomas A. Shoemaker & Co., of Pittsburg, Pa. This is the continuance of the work that has been going on for several years in straightening the alignment and making a low grade freight line from Relay to Washington Junction, upon which over $2,000,000 has already been spent. This new improvement will cost between six and seven hundred thousand dollars, and the contractors will begin on it at once.

It is an important piece of railroad construction that will include two tunnels, and some time will be required for its completion. It will be a standard double track line, including one tunnel 1,000 ft. long and another 500 ft. long between a point west of Hollofields station, on the east and Davis station on the west.

The present roadbed will be entirely abandoned and re-located, except for a distance a little less than half a mile, located east of Alberton, which will be raised and straightened. This improvement will eliminate 542 degrees of central angle and reduce the maximum curve from 12 degrees to 7 degrees, shortening the distance nearly two-thirds of a mile and reducing the maximum grade west bound from .9 percent to .5 percent. It will place the roadway well above high water and free from damage by freshets, which heretofore have occurred almost every year.

The present road between Hollofields and Davis is an extremely bad piece of alignment, having a succession of sharp curves and in many cases reversing upon themselves, and which has been the cause of many derailments of cars and locomotives; then, too, the grade is laid so low that a proper waterway cannot be had at one of the crossings of the Patapsco river, with the result that from this source great loss has been incurred almost every year from high water and ice gorges.

The new line will do away with all this trouble and add materially to the plan to make the old main line one of the best pieces of railroad in the country for the handling of freight traffic.

The battleship Vermont will be launched at the yard of the Fore River Ship Building Co., Quincy, Mass., on August 31, and will be christened by Miss Jennie Bell, daughter of the governor of Vermont.

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LIVERPOOL SHIPPING LETTER

Liverpool, July 20.—Sir William Mulock, postmaster-general of Canada, now on a visit to England in connection with the Pacific cable conference, has just delivered an important pronouncement regarding his plans for beating New York in the transit of the British-American mails. Regarding the fast passage made by the Allan turbine steamer Virginian which has reduced the length of passage between Moville and Cape Breton by at least one day, he said that was indeed a distinct gain. Canada had geography on her side in the matter and would ultimately command the entire mail traffic between the British Isles and the North American continent. Giving a direct answer as to whether he entertained any hopes or plans for beating New York, he said: "We do, and I can throw the inevitable into figures for you in a minute. Our port of Sydney, Cape Breton, gives Canada a geographical advantage of 3,000 miles. Let us have steamships of but an average speed of 19 knots and with the complete railway system which Canada will possess we could deliver the mails in Chicago and New York sooner by a single day of 24 hours at least than the fastest steamers could which the Cunard Co. might sail to New York. This will come. Nowadays commerce cannot wait, and is not bound by hard and fast rules of place or nationality. What is wanted is the earliest and the fastest mail, and Canada will give this by way of Sydney, Cape Breton. Canada has in front of her ten years of continuous railway development. This should mean trade for England."

The truly grand work of the Allan liner Virginian which crossed from Moville to Cape Race in 4 days 6 hours, has demonstrated the practicability of the turbine for ocean propulsion at high speeds, if such further evidence were needed. As the turbine has now won the record for the Canadian run it is to be hoped that at no very distant future period the turbine express Cunarders will also make a new record for the New York route.

There seems to be no doubt now that the International Union of Sailing Ship Owners will go forward and accomplish much of the work that brought it into being. At a meeting of the committee just held in Hamburg it was reported that over 800 ships were now entered in the union, representing about 1,500,000 registered tons. One of the principal changes authorized by the meeting was an alteration of the reduction for direct port to 18 cents, instead of 30 cents, to take effect from Sept. 1 next.

The unprofitable state of shipping generally has also brought into existence the International Association of Baltic and White Sea trades. Its main objects are: (1) to unite steamship owners in order to minimize and regulate competition in the Baltic and White Sea trades, and to endeavor to put a stop to the deleterious practices of freight speculation by brokers; (2) to improve charter conditions; (3) to communicate to members instances of unfair charges and claims and objectionable practices which come to the knowledge of the association; and (4) from time to time to fix minimum rates of freight as required. Although the true cause of the bad state of the freight market is that there is too much tonnage in the market, the committee has not deemed it right to tackle the question of laying up tonnage. It is intended that the question shall be taken up later on when the association has got into proper working order. A minimum freight scale has already been adopted and came into force on June 15, and will operate until the next conference in November.

The Royal Mail Steam Packet Co. has just received delivery of its new steamer, Aragon, built for it by Messrs. Harland & Wolff of Belfast. The new steamer is 527 ft. long, 60.4 ft. broad, 35 ft. deep and of 10,000 tons gross register. In the Aragon many interesting features have been introduced, one of which, a special elevated gangway, built in order that passengers can ascend and descend from the main entrance, will be found a great convenience. The social hall, which calls for mention, is situated on the promenade deck and is 53 ft. long by 29 ft. wide and furnished in oak. This room is designed to serve the same purpose as the lounge in a modern hotel and in this apartment, after dinner, passengers will be able to take their coffee and cigarette, while the fore end will be practically reserved for those who do not wish to indulge in the fragrant weed. Altogether the Aragon may be described as a magnificent specimen of a floating hotel, and the Royal Mail Company have spared no trouble or expense to insure that the vessel shall represent both structurally and architecturally the highest excellence yet attained in the art of shipbuilding. The engines consist of two sets on Messrs. Harland & Wolff's hydraulic expansion principle, which reduces vibration to a minimum, and the ship will have the increased security of two propellers, and be also fitted with bilge keels which will reduce rolling to a minimum.

As some attention seems to be attracted at the present time to the numerical strength of the United States naval reserve, it may be interesting to readers of the *Marine Review* to have some particulars of a recent launch in Britain of a ship specially designed for the training of boys for the naval and merchant marine, which in some respects is unique, serves to draw attention to the work being done in this direction and the need for further development along the same lines. This vessel built by Messrs. Vickers, Sons & Maxim, of Barrow, is intended to take the place of the old Exmouth, which has lain off Gray's on the coast of Essex, where young lads from the streets of London, who might easily have gone astray, have been developed, mentally, physically and morally into first-class seamen, while others have passed into the army. Indeed each year there are drafted from the ship into the Royal navy from 100 to 150 lads; into the merchant marine over 120, and into the army about 50, all capable of exercising a salutary influence upon their comrades. The new ship follows exactly the form of the old line of battleship, the dimensions being, length 300 ft., breadth 53, and depth 39 ft. The hull is of steel except the underplating of the shell, which is of 7/8-in. iron to avoid corrosion, and everything has been done to make the 600 boys it will accommodate, healthy and happy. Few lads who have passed through such a ship have any inclination to return to the poorhouse or to a life of squalor, as is too often the case when early associations are connected with that undesirable institution, while some of those who have passed from the ship have at the age of 40 secured annual pensions of £50 for life from the navy. Many others have risen to the rank of petty officers. And this is but one of a great number of similar ships stationed around the coasts and in the principal rivers of Great Britain.

The settlement of the loss of the Glenburn, from San Francisco for Liverpool is proceeding in the London market, and is believed to be one of the heaviest of recent years, running into about $500,000. The cargo consisted of California wine, tinned salmon, honey, tinned fruits and grain, and was insured in the "pool" with the London & Liverpool companies, who have given off some part of their heavy line to Lloyd's.

The Manchester Ship Canal Co. continues to make headway, both as regards increased traffic and additional revenue. The receipts for May amount to $183,050, as against $105,550 in May 1904. The increase for the five months of the current year is now $28,740.

The United States army transport Meade, which has been lying in San Francisco Bay for the past three years, is to be repaired at the Risdon Iron Works, San Francisco. She will be thoroughly overhauled, fitted with a new main deck and her boilers put into good condition. There is a large sum left over from last year's appropriations for repairs to transports and some of the money will be used on the Meade.

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AUGUST 3, 1905.

A very significant statement is made in the annual report of Major Charles L. Potter, in charge of the harbor work on Lake Superior, which has just been forwarded to the war department at Washington. Said he: "The total amount of money expended by the government on this harbor since 1867 is $4,831,514.14. The vessel freight received and shipped at this port during the same period was 155,547,901 tons, and its market value is estimated as $2,144,080,679. From this it is seen that the cost of the government improvements has been less than a quarter of one percent of the value of the freight handled at this port. It has been estimated that the entire saving in freight rates on Lake Superior during a single season is within $5,000,000 of the entire amount appropriated on the lakes above Niagara Falls for the formation of government works.

The commerce of the great lakes in its transit from the head of the lakes to Buffalo passes through an artificial waterway which is five miles longer than the artificial waterway that will have to be constructed across the Isthmus of Panama.

Approximately $50,000,000 has been expended by the general government in improving the channels of the Great Lakes; yet as Major Potter indicates, the annual dividend is equal to the total expenditure since appropriations were first begun. As the channels have been deepened vessels have grown greater, since draught must always determine dimension. As the vessels have grown carrying capacity has increased, with a coincident falling of the freight rate. Iron ore is now moved along the great lakes 1,000 miles for 75 cents. When the Sault canal was opened in 1855 the average freight rate was $3.00 a ton. In 1866 conditions operated to increase the freight rate to $4.17 per ton for that year, which is the highest average in the history of the great lakes. Since then they have steadily fallen until they have now reached the level of 75 cents, which is less than the rail rate from Minnesota mines to shipping docks. All freight of whatsoever character was moved on the great lakes last year at 81-100 of a mill. The transfer of commodities at so exceeding low a rate as this must serve to benefit the whole people since it cheapens production. The cheaper an article becomes the greater grows the consuming market.

There is an occasional quibble in Congress over an appropriation for the improvement of waterways but certainly there can be no wiser expenditure of money than the improvement of established channels. It is infinitely wiser than appropriating money for the support of an army or for the building of a great navy. Appropriations that stimulate commerce are sensible ones. The trade of the great lakes under the fostering care of the general government, first by making the channels adequate, and second by reserving them to American ships exclusively has vastly benefited the American people. Were the same policy in operation with our over-sea trade who can say that it would not have the same result?

A very conservative measure is now before congress for the protection of foreign shipping. It proposes to levy a tonnage tax against all vessels, foreign and American alike, but to distribute the tax to such American ships as carry boys for the formation of a naval reserve and that conform to certain other conditions of service. This money is derived solely from shipping. Not a penny of it comes directly out of the treasury. It seems to us both a reasonable and a wise measure and it ought to be placed upon our statutes.

CANAL FROM LAKES TO TIDEWATER

Prof. Gardner S. Williams, professor of civil engineering at the Michigan university, who recently resigned from the international waterways commission, in discussing the Panama canal recently in Washington said:

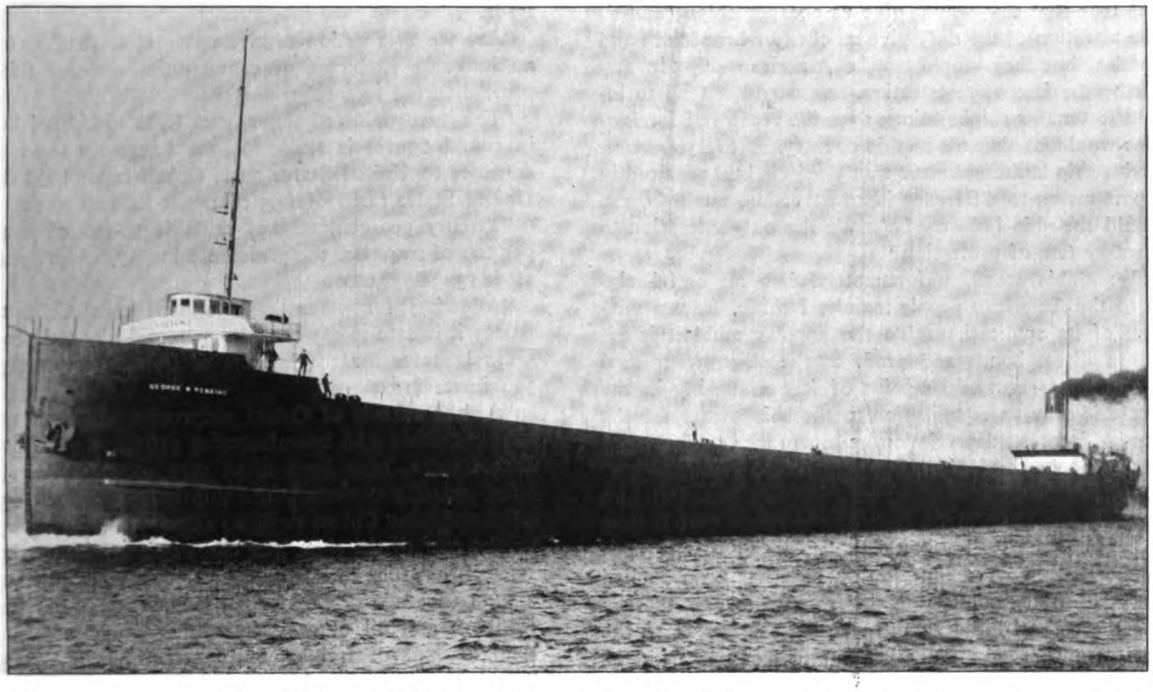
"While not strictly opposed to the isthmian canal, nor in sympathy with the position that several railroads have taken in the matter, yet I am of the opinion that an outlet from the lakes to the tidewater would be vastly more beneficial to the American people as a whole. Perhaps it would not give up as much prestige in the eyes of Europe —and that's what America seems to be aiming at just

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now—but it would have three great results, namely: That of immensely increasing the commerce of the great lakes, the development of our great northwest, a section of this country that offers wonderful opportunities, and the opening up of those fertile Canadian provinces lying along our borders.

"The Canadian country is very similar in climate, minerals and other resources to Iowa, Michigan, Wisconsin and the Dakotas, and offers the same advantages to the farmer and the cattle raiser. As we know, Michigan, bordering on Lake Superior, is rich in deposits of copper and iron. And just as much so is the province of Ontario, which is Michigan's northern neighbor on Lake Superior.

"Is it not apparent, then, that when such a country is open to commerce with the world the entire northwest, as well as Canada, would feel its untold benefits? On the other hand, I cannot see that America is going to receive any such advantages from the isthmian proposition. It seems to me that Europe is to be given a greater share of its benefits. In the meantime, while we are entirely neglecting the great lake waterway, the Canadians are growing impatient; and, as I understand, there is a movement up there which strongly favors the building of their own canal. It will not be a route that will benefit us, however, but will be an outlet from Georgian Bay, through Lake Nipissing, down the Ottawa river to the Atlantic ocean."



THE PITTSBURG STEAMSHIP CO.'S NEW STEAMER GEORGE W. PERKINS.

IN BEHALF OF OUR MERCHANT MARINE

Mr. W. D. Winsor of the Boston & Philadelphia Steamship Co., Philadelphia, made a telling speech before the Merchant Marine Commission in behalf of American shipping at its session last year. He said:

"In referring to the subject under consideration there have been several forms of assistance advocated to remedy the evils under which American shipping is now languishing, i. e.: Bounty to shipowners building ships; compensation for carrying the mails; discriminating duties; free ships; subsidy.

'Bounty to ship owners building ships: This would take the shape, as I understand it, of a bounty per ton paid to the merchant to offset the difference in cost between a ship built in America and a foreign-built ship. There would be great difficulty in arriving at and maintaining the proper bounty per ton, inasmuch as the cost of building constantly varies with changing conditions in this country as well as abroad and what would be correct one year might not be the next. Further, the bounty per ton would vary with the different character of vessel—a freight steamer not being in the same class with an ocean liner. This bounty, however, would not in any way offset the additional cost of running expenses, wages, maintenance, etc., which is one of the greatest burdens the American shipowner has to bear.

"Compensation for carrying the mails: The end sought to be obtained by the extension of legislative aid, as I understand it, is the building in this country of freight ships to ply to all parts of the world, which would give us not only our share of the carrying trade, but employment to our people, to the capital invested in our great shipyards, and work both in the yards, and in the interests allied to shipbuilding. In order to be economical, vessels of this class are necessarily of moderate speed, while it is an essential requirement that the mails should be carried upon fast vessels; in addition to which there are many ports to which the mails could be forwarded more rapidly by other means. In many cases the amount of such aid would necessarily be inadequate to accomplish the purpose it is sought to attain, that is, the running in competition with the cheaper vessels of other nations. Compensation for carrying the mails, therefore, does not seem to cover the ground, nor is it broad enough to build up American tonnage.

Discriminating duties: This is a very intricate subject. As I understand it, this is a proposition to remit to the consignees a certain percentage of the duties upon goods if imported in American bottoms, or to impose an additional duty if carried in foreign bottoms. This would certainly in one case benefit the importer who would be fortunate enough to forward by an American vessel, but it would help the shipowner only by tending to give American vessels the preference. I cannot see that it would aid in any way to confine our export trade to American vessels, and this is a large and important part of the trade between the United States and foreign countries. It is

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also open to the objection that it is not general in application, inasmuch as there are many ports from which the bulk of the goods imported are free and upon which there would be no duty. In certain lines of trade the goods bear a high rate of duty and it would be an inducement to ship by American vessels, but on goods of a different character and less value the same inducement would not exist. In any case, the quantity of such goods would be uncertain on each voyage and the shipowner could not feel assured that the quantity would be such as to make the business remunerative to him and warrant him in building and running vessels under it. It is probable also that discriminative duties would interfere with existing commercial treaties with other nations; in any event it would be likely to cause retaliation in some form upon their part. At best, it is a cumbersome method and uncertain in its application.

"Free ships: This is nothing but free trade, pure and simple, and seems a most inconsistent method of remedying the present condition of the American merchant marine, which has been caused by the high protective tariff upon all other products. It is true that this would give us cheaper ships (and so would the abolition of the duty give us cheaper broadcloth and other goods), but they would not be American ships in any sense but by the fact of registration, nor would it tend to increase and foster our shipbuilding; even the repairs of foreign-built ships would be difficult in this country, as everyone conversant with ship building knows that a ship is best repaired in a home port owing to difference in construction, methods, etc. Why should the ship industry be made the only exception to our present system of protection?

"Subsidy: This word, unfortunately, has an awful significance to the American people mainly, I think, from a misconception of its application. To the popular mind it is regarded as a direct bonus and profit to the ship owner paid from the public treasury. In point of fact a subsidy in the present case is only an equalization to the ship owner for the yearly loss of interest, depreciation and insurance on increased cost of building in the United States, and the increased cost of running, wages, maintenance, etc., thereby enabling him to derive only the same profit from the business that is now enjoyed by foreign vessels, all these disabilities having been produced by the policy of protection which has been applied to almost every other industry to its great advantage, thereby enhancing the cost of building and running the vessels to the American shipowner who has been left to struggle with the problem as best he could.

"In all cases the plainest, simplest and most straightforward method is the best. The payment of a moderate subsidy per ton per mile traveled is broad and equal in its application and of such character as to enable the shipowner or capitalist to easily estimate whether with such assistance he can profitably build and operate vessels not in one line of trade only, but to all parts of the world. Divorced from 'subsidy' by the substitution of some other word, this method would lose some of its terrors.

"I therefore advocate the direct payment of a moderate compensation per ton per mile to all classes of steamers and sailing vessels engaged in foreign commerce as the best remedy for the existing evils."

MORLEY DISCUSSES CUBAN TRADE

Mr. H. T. Morley, of Detroit, discussed Cuban trade before the commission as follows:

"Noticing among other suggestions for the advancement of American shipping the idea of giving a preferential tariff on imports when made in American bottoms, I wish to call your attention to this treatment of the trade from Cuban to American ports. This scheme is open to all and not subject to the criticism of subsidies. The commodities of sugar, coal and iron ore move in full cargo lots. The merchant wishing to engage tonnage to move full cargo lots consults his broker as to the market for freighting and does not apply to a line agency to ascertain the established rate. It is open for competition to any ship seeking such business. There are always plenty of ships seeking business, or soon will be if a chance of profit offers. As an instance of the quick response of American shipping interests to an opening for profitable business, look at the oil carrying trade from Texas ports to North Atlantic ports. Two years ago there were no steamers fitted to carry oil, now there are upwards of thirty such steamers engaged in this trade and the competition is already keen.

"Cuba offers today the best opportunity for the application of the preferential tariff in aid of American ships. We have already entered into a reciprocity treaty and the basis is ready to extend this treaty in aid of shipping. Cuba lies at our door and its coast is but an extension of our own coast line. The exchange of trade between the two countries is in its beginning and now is the time to introduce such measures into the reciprocity trade arrangements as will permit American ships to begin and their numbers increase with the demands of the trade.

"Are we as a nation to give up revenue tending to build up an immense exchange of commodities and see this carrying trade diverted to foreign ships?

"The importation of sugar from Cuba to United States ports in round figures is 1,000,000 tons (2,240 lbs.) per year. On entrance to United States ports Cuban sugar pays the regular United States tariff of 1.95 cents per lb. less 20 per cent.

"Twenty per cent of 1.95 cents is 39-100 of one cent, or, per ton of 2,240 lbs. the preference is $8.736; for 1,000,000 tons at $8.73, $8,736,000.

"Allowing for other importations from Cuba to United States it is safe to say that the price paid by the people of the United States for the benefits of Cuban reciprocity will approximate $10,000,000.

"As the scheme of Cuban reciprocity has been worked out all agriculture and manufacturing products of United States, except ships, have been taken care of. The carrying trade being entirely neglected, the ship builders given 25 per cent off the regular Cuban tariff on ships. This is not 25 per cent on the cost of the ship. The cost of carrying 1,000,000 tons of sugar from Cuba to United States ports is about $2,000,000 per annum (average rate of freight is about $2.00 per ton). Coal, iron ore and all other commodities would safely bring the total amount of freight up to something like $3,500,000 or $4,000,000.

"This trade is just beginning and bids fair to increase by leaps and bounds. A very small percentage is carried in American ships, fleets of English, Norwegian and German ships monopolize the business—a business built up by reciprocity. Cannot some preferential tariff be arranged so as to permit United States ships to enter this trade? The foreign ships in this trade are not trading direct between ports of their nationality and United States ports—the most favored nation clause should not apply in this instance. Recommend the passage of a message by congress granting a reduction of duty on sugar transported from Cuban ports in American ships. This would not only secure to American ships the sugar carrying but also the return cargoes of coal."

The maintenance of way forces of the Erie are now engaged in laying 350 miles of 90-lb. steel rails on the main track. A larger mileage has never been laid in any one year before. The Erie has always been noted for its good track, and the management finds that it is necessary to use a heavier rail on account of the weight of the several hundred new engines that have been purchased in the last two years. Much of the rail being removed has only been in track four or five years and will be used on branch lines.

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OPPOSITION TO SHIP CANAL

Buffalo, Aug. 1.—The action of the State Canal Board in ordering the locks of the 1,000-ton barge canal built ship-canal size instead of the size contemplated in the original plan, has raised a storm of protest on the part of the original canal-improvement interests, and if the measure is allowed to stand it will be in spite of their opposition. We look upon such a proceeding as a wanton waste of not only money, but a throwing away of the very principle that we stood for, with nothing gained but a chance for the enemies of the canal to say "I told you so." It is very exasperating, and it is not going to be carried out without a strong protest.

The exact reason for the action of the board does not appear as yet, but let it be what it may it is not to be excused here, and it is here that the sentiment and the energy that carried the canal-enlargement measure through originated. There is no ground for suspicion up to this time that the board has any taint of the ship-canal heresy about it, but the action adopting a 14-ft. lock 45 ft. wide plays directly into the hands of that element, so far as it can be done. It was hoped that the ship-canal people had gone into some more practical business, like the promotion of Canadian ship railroads—on paper—or something of the sort, but it will be odd if they do not come to the surface again at this juncture.

Let it be understood that Buffalo has opposed the ship canal idea with the full understanding that there would be those to say that she merely wanted to handle the grain passing through by lake and canal. We are willing to stand this charge of self-seeking, because the fact was quite otherwise, and we can now go into the fight again as before on the general merits of the question. The Chamber of Commerce has called a meeting for this week on the matter, and if there is any intimation that grain-handling desires to animate the opposition to deep locks it can be met in a dozen ways.

In the first place it was distinctly maintained all through the final and successful campaign for canal enlargement that the grain traffic had dropped down to a mere incident in the question. It was iron and its manufacture that we were at work for. The grain traffic is nothing to this port compared to what it was a dozen years ago, and may not be restored, but iron is coming rapidly into our calculations and that must be handled here, first as ore and then as the more or less finished article.

If anyone should ask why we do not believe in the ship-canal idea, let it be said first that to introduce it now is bad faith. It was not contemplated by the projectors of the 1,000-ton-barge idea. It will cost a large amount of money and will be money entirely thrown away till the whole canal is constructed to correspond. Then the ship-canal plan is opposed on general principles. The first cost would be too great; the running cost would also be too great, not only in water, but in lock tending and repairing, and in the hundreds of swing bridges to be built and kept up; the lake and ocean traffic are so different that the same craft is not suitable to both and the three-mile pace of craft in a canal 350 miles long demands a very low-cost vessel.

It is not generally understood that it has been the cheap canal boat alone that has kept the traffic alive so long as it has. A canal boat worth less than $1,000 is still allowed to carry grain worth $10,000, as wheat prices have ruled this year, while the freight car or lake steamer is usually worth considerably more than its cargo of grain. This item alone counts in such a telling way in favor of the cheap vessel that it was very wisely kept in sight in the planning of the improved canal. A light steel barge for the new fleet will cost something more than the old wooden boats did, but its lasting qualities and better floating qualities will more than make up for the extra cost. It will still, even when new, be worth much less than its cargo and can afford to move at a slow pace.

There are no arguments in favor of a ship canal that will hold water for a moment. Even the 14-ft. limit contemplated by the canal board is of no account even now, and it fully warrants the charge that the board as a whole has no grasp of the situation. We are pleased to find that the Tonawanda member, Treasurer Wallenmeier, was better posted and opposed the measure. The Welland canal is well known to be a failure and was at the moment it was finished to 14 feet. What sense would there be in our doing the same thing twenty years later?

A ship canal to be of account now must not only be dug 20 feet at the least, but it would need to be a box with cemented sides, so that vessels could make some speed in it and it should be at least 150 ft. wide. Let the canal board or the ship-canal man figure out the cost of such a canal. The idea would be dropped very promptly.

JOHN CHAMBERLIN.

WE MUST HAVE SHIPS

Editor *Marine Review:*—Is it not a perfect farce that of the $68,526,000 total commerce between the United States and Cuba in the six months ended June 30, 1904, only $20,894,000 was carried in American ships, steam and sailing? British ships carried more, namely, $21,822,000, of which $21,002,080 was for goods which we bought from Cuba. American ships carried $9,067,000 of our shipments to Cuba, and brought $11,827,000 of Cuba's shipments to us. Norwegian vessels carried $14,620,000 of the $68,526,000; Cuban, $5,393,000, and Spanish, $2,814,000. It is gratifying that Cuban vessels carried nearly twice as much as did Spanish vessels.

It is true that 1,090 of the 2,401 vessels which entered Cuban ports in the six months, sailed from American ports, but only 456 of them were American vessels. The gross tonnage of those 456 vessels was only 475,716, out of 4,646,872 total gross tonnage entering Cuban ports. That is a poor record for us—only one-tenth of the total tonnage entering ports only a few miles away, in a country whose ports and waters should really be as our own for commercial purposes.

Of the $68,526,000 total commerce, no less than $53,109,000 was for goods which we bought from Cuba. Only $11,827,000 of this came in American vessels. On the remaining $42,000,000 worth we had not only to pay for the goods, but also, directly or indirectly, to put the freight monies in foreign pockets, besides the freights on $6,500,000 of the $15,500,000 worth of goods we sold Cuba.

Argument upon congress for an ocean-going marine has become wearisome, but the fact remains that to do American business in sufficient quantity and profitably, as President McKinley said at Buffalo, "We must have ships."

WALTER J. BALLARD.

Schenectady, N. Y.

United States Lightship No. 67, anchored near Destruction Island, off Cape Flattery, on July 17 was damaged by an explosion, which caused the death of several of her crew and scalded others. The steamer Tricolor, bound from San Francisco to Nanaimo and Neah Bay, took her from her anchorage to Neah Bay, whence the tug Pioneer towed her to Port Townsend, Wash. It is supposed that the explosion was caused by getting up steam preparatory to moving the vessel from her anchorage for repairs.

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BRIDGING THE STRAITS OF CARQUINEZ

Secretary of War Wm. Taft was in San Francisco very recently on his way to the Orient. While there he made a personal examination of the Straits of Carquinez across which the Southern Pacific Railroad Co. is very desirous of constructing an immense bridge. The question of the construction of this bridge is the most important one that has perhaps arisen in San Francisco for the past quarter of a century. Such a structure would directly and indirectly affect the interests of navigation and commerce of the entire upper part of the bay, and of the great port of San Francisco.

From the very start, this project has been bitterly opposed by ship owners, shippers, river steamboat companies, merchants—in fact by all classes having any interests in marine and commercial matters. Of course the opposition is based solely on the ground that such a structure would be a very grave obstruction to navigation to all that stretch of the bay above the straits.

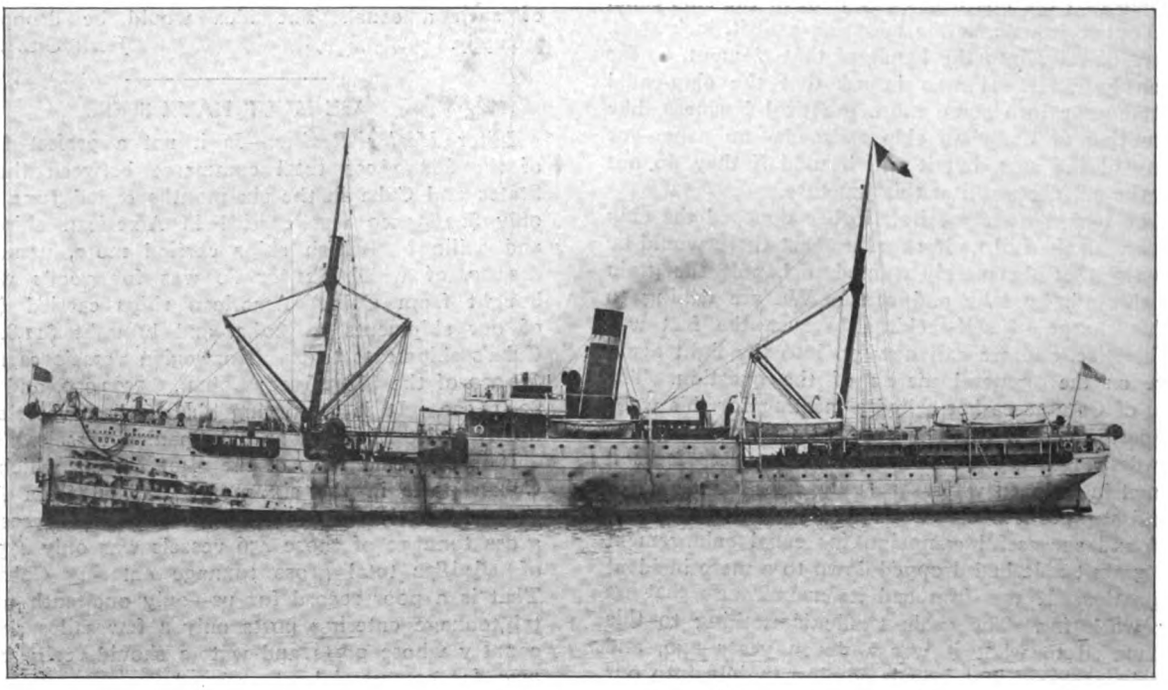
Application for permission to build this great bridge and the vigorous remonstrances against such an obstacle, have been before the war department for months. Secretary Taft said: "I expect to appoint a special engineer to consider the Carquinez matter. A proposition involving such large interests should not be left to the decision of one man. With engineers as with doctors, it is well to have the opinion of a number of them. Our army engineers are excellent, but I think a civilian expert should be called in. The particular man for the place has not yet been selected positively, and no definite steps will be taken until my return from the Orient. There is no question but that a bridge must be built. The interests of San Francisco, already a great and flourishing metropolis, demand it. San Francisco cannot fulfill her destiny without keeping in close touch with the east by rail.

"Nowhere in the civilized world near the great avenues of commerce will you find straits of the character of Carquinez unbridged. The question to be considered is what kind of a bridge will accommodate the land traffic without interfering too seriously with the traffic by water? All bridges are in the nature of obstructions to shipping, but with the right design this can be reduced to a minimum."

Secretary Taft stated that he would act in a judicial capacity only, and that the initiative for a bridge would not come with him. He continued:

"All that I can do is to pass upon such plans as are proposed. It may be that the construction of the bridge will be delayed for some time. It all depends upon the necessities of traffic. Perhaps it will not at present bear the expense necessary to build a proper bridge."

Assurances were given by Secretary Taft that he would not approve of any designs which were not of a character to preserve the necessary freedom of the straits to navigation. It was a question of compromise, he declared, the interests of interstate commerce and of shippers needing both to be carefully weighed and guarded. That should be done in the exercise of the power belonging to the secretary of war, he affirmed.



CABLE SHIP BURNSIDE.

MORE WORK FOR THE CABLE SHIP BURNSIDE

The appropriation by congress of $95,000 for the extension of the Alaska military cable from Valdez, its present terminus, to Seward on Resurrection bay, is providing new work for the United States cable ship Burnside, which, since the completion of the present section of the cable has been laying up at Tacoma, Wash. The contract for the additional stretch of cable has already been let by the war department, and as soon as it is completed it will be shipped to Seattle to be loaded on the Burnside for laying. It is anticipated in Alaska that the work will be completed during the present summer.

The present Alaska cable system, laid, owned and operated by the government, consists of 2,127 miles of line, connecting Seattle, Wash., with Sitka, Juneau, Fort William H. Seward, Skagway and Valdez in Alaska, and connecting at Valdez with a government land-line telegraph system covering 1,504 miles, which in turn connects at St. Michael with a wireless section of 107 miles across Norton Sound. The first appropriation for the construction of the system was made in 1903, at which time the cableship was in China, undergoing repairs. The cable was manufactured in New Jersey and transported to Seattle around the horn in the steamship Texan. Mean-

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while the cableship was dispatched from China to Sitka, where a survey was made of the bottom of the ocean between that point and Juneau. The vessel then proceeded to Seattle, where that portion of the cable was loaded, and returning to Sitka laid the first section of the cable, that between Juneau and Sitka, a distance of 290 miles, completing that section on Oct. 3, 1903. The Burnside then laid 140 miles of the Sitka-Seattle section southward from Sitka, and left the end buoyed in 600 fathoms of water.

Exigencies then called the Burnside to the Philippines for the repair of old cables, and it was not until June, 1904, that she was able to resume the work in Alaska. Meanwhile storms had carried away the cable buoy, rendering it necessary to recover all of the loose

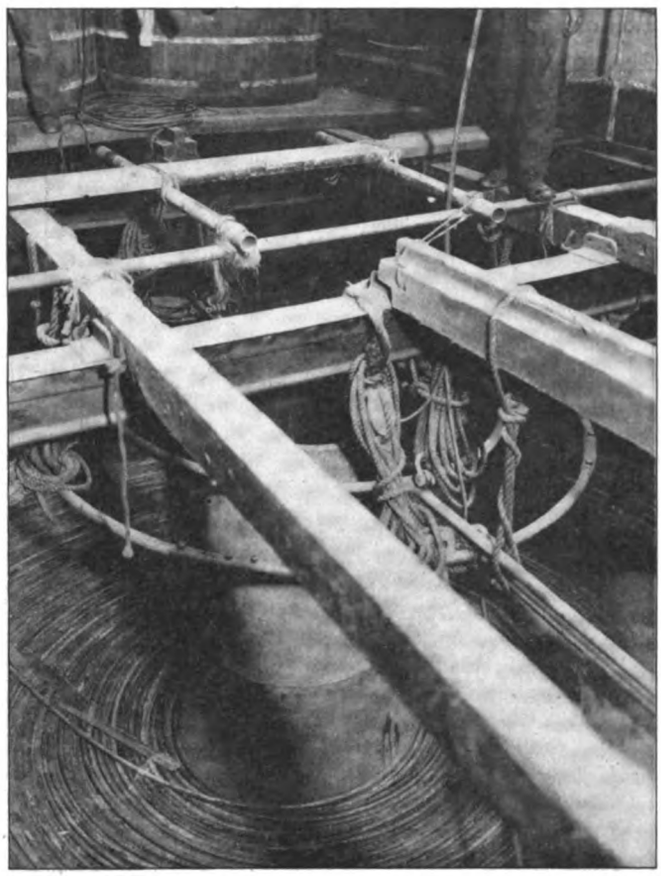


BURNSIDE TAKING CABLE FROM THE TEXAN.

cable laid. This was done and the work of laying the line on to Seattle continued and completed by Aug. 28, 1904. This section of the cable was then thrown open to the public, and the vessel and her crew, under command of Maj. Edgar Russell of the signal corps, returned to Alaska waters to lay the Sitka-Valdez section. This section of the cable, 750 miles in length, was transported across the continent by rail. The Burnside sailed from Seattle with it on board on Sept. 18, and completed laying the Valdez-Sitka line Oct. 3, 1904.

Since completing the work of laying this last section the Burnside has done some little work on Puget Sound, changing, improving and duplicating the shore-line terminals, and has made one trip north to repair a break in the main line, which arose from a cause which is believed to be entirely unique in ocean cable operation. A few miles north of Sitka a huge whale attempted to bite the cable in two, only to become entangled in its meshes, where he struggled until life became extinct. Though he succeeded in penetrating the insulation cover the transmission wires were still intact when the Burnside's crew drew the whale up out of the water and cut it loose. As soon as the new section of cable now in process of manufacture, can be dispatched to Seattle the Burnside will proceed north to lay it in place. It is designed to provide connection with the rest of the system for Seward, the ocean terminus of the Alaska Central railroad, which is now under construction between Resurrection bay and the Tanana river.

The Burnside was formerly a Spanish steamship and was captured as a prize by Admiral Dewey at Manila in May, 1898. She is manned by Filipino sailors, the little brown men having proven entirely capable and satisfactory for the work required of them.



CABLE IN BURNSIDE'S HOLD.

MAJ. LANSING H. BEACH'S REPORT

Appropriations amounting to nearly $650,000 are recommended in the annual reports of Maj. Lansing H. Beach for the lighthouse establishment, the river and harbor work and the lake survey. The sums proposed are for the improvement of the shelter at Harbor Beach, the construction of various lights, stands, etc., and the carrying on of the survey and water level work.

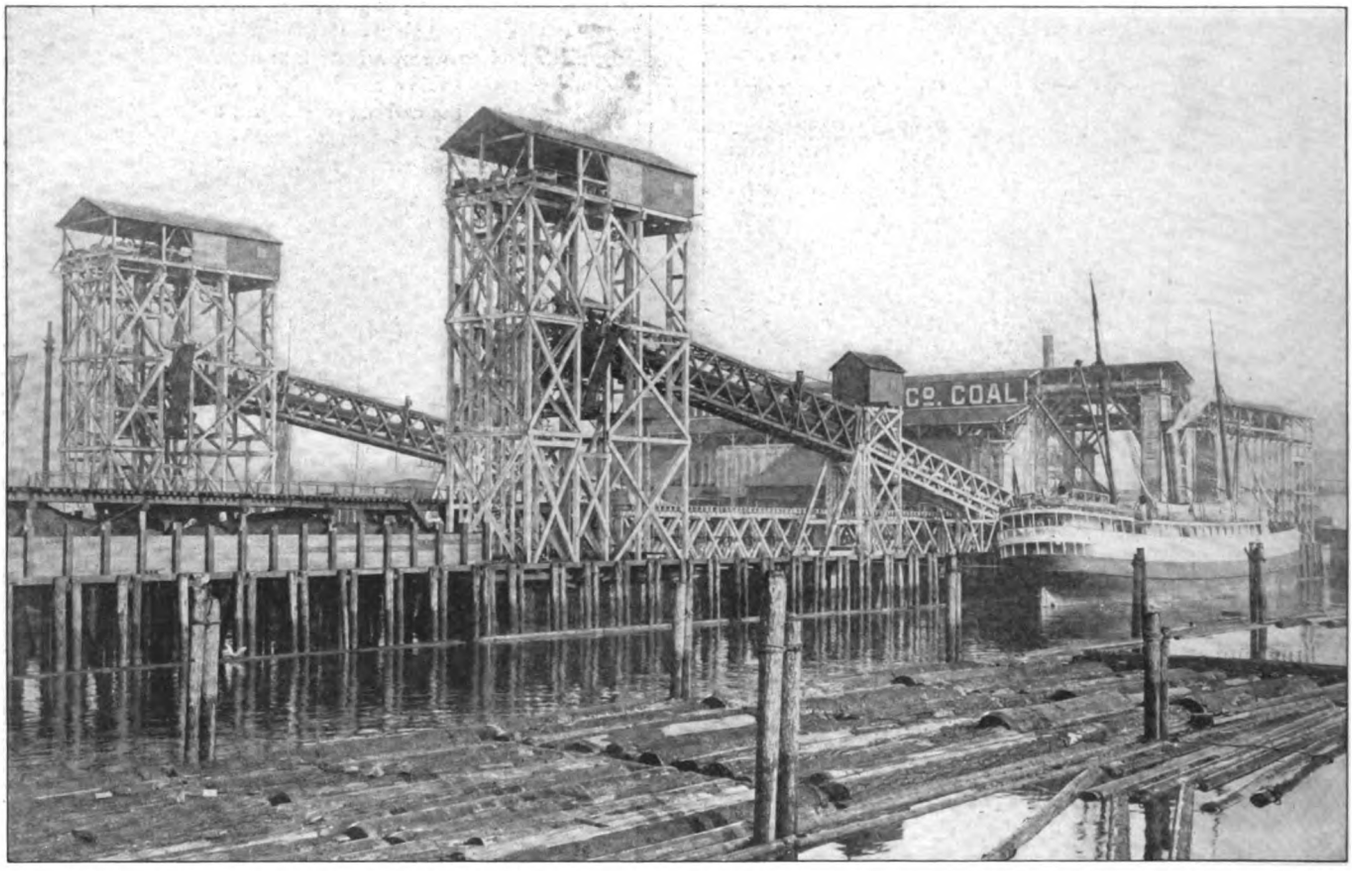
Major Beach states that $300,000 should be expended upon the main pier at Harbor Beach to complete the concrete work there. He gives interesting statistics regarding the use of the shelter. From July 1, 1904, to June 30, 1905, 1,041 vessels, with an aggregate tonnage of 761,606, sought refuge in the harbor from storms. The total amount expended on the harbor to June 30, 1905, is $1,763,846.21.

In the lighthouse report, Major Beach urges appropriations amounting to $311,700. Part of this is intended for work near Detroit. A prominent beacon is recommended for Isle aux Peches, to cost $18,000. Windmill

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point is mentioned for a keeper's dwelling costing $5,000, while a $3,500 oil storehouse is proposed for the depot at Detroit. Among the larger items are $50,000 for finishing the light and fog signal at Rock of Ages, Lake Superior, $38,000 for moving the Eagle river station to Sand Hills, $13,200 for a light and range at Grand Island harbor, $21,000 for lights and ranges at Rock harbor, $55,000 for a crib at the entrance to Portage lake ship canal, $22,000 for lights and signals at Portage river pierhead, $38,000 for a light and fog signal at Nine Mile point, and $28,000 for the reconstruction of the range and fog signal at Superior pierhead, Wisconsin.

There are now six parties on the lake survey. The sum of $115,000 is recommended for carrying on the work, while an additional $10,000 is proposed for the investigation of water levels.



MARINE COALING PLANT OF 16,000 TONS CAPACITY, SEATTLE, WASH.

NEW MARINE COAL BUNKERS AT SEATTLE

The Pacific Coast Co. has recently completed at Seattle a new marine coaling plant of 16,000 tons capacity and capable of handling coal to ships at the rate of 1,500 tons an hour. The main bunkers are 80 x 176 ft. on the ground plan and consist of twenty-six compartments, while the secondary or tug bunkers are 20 x 144 ft. on ground plan and have sixteen compartments. The entire plant is equipped with endless chain conveyors supplied by the Link Belt Machinery Co. of Chicago, which equipment consists of two main wharf conveyors each 600 ft. in length and consisting of corrugated steel belts 4 ft. wide and with a capacity of 750 tons of coal each per hour; two chain bucket conveyors each 530 ft. long running across above and returning under the main bunkers and used for conveying coal from a hopper under the railroad tracks into which the coal is dumped from cars; a flight bucket conveyor to the tug bunkers with a capacity of 250 tons an hour; and cable conveyors for collecting screenings from retail delivery chutes and for delivering fuel to the power plant.

There are two piers each 500 ft. in length, with a tower on each to which the conveyor chutes run, so constructed as to permit the delivery end of the conveyor chutes to be raised or lowered to suit the level of the decks of vessels at varying stages of the tide. In designing the plant the architect kept in mind the dimensions of the mammoth steamships Minnesota and Dakota which take coal at Seattle, and the plant is so constructed that one of these big vessels can run between the two piers and take coal from both towers at the same time.

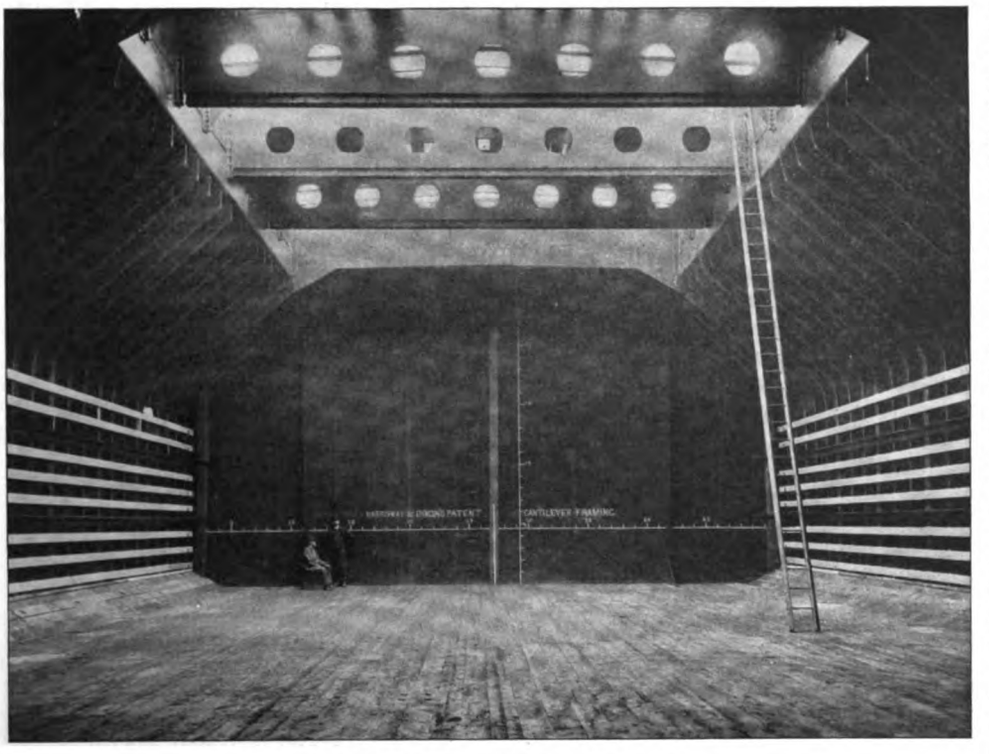
Power for the plant is developed by an adjacent steam power plant, coal screenings being used for fuel. The plant consists of two Babcock & Wilcox water tube boilers, each consisting of fourteen sections of nine 4-in. tubes 16 ft. long, and two 36-in. steam drums 22 ft. long; two 125 H. P. engines of McEwan Engine Co. make; two 8-pole, 160 K. W., 260 revolution, 250-volt direct current, direct connected generators of General Electric make, three marble switchboards with General Electric equipment, and nine General Electric motors varying in size from 10 to 85 H. P. Coal is mined by The Pacific Coast Co. at its mines in King county, Washington, at the rate of 3,000 tons daily, carried to the bunkers over the Columbia & Puget Sound railroad, and loaded there in ships both for fuel use and for transshipment to other markets.

The Reid Wrecking Co. of Port Huron, will undertake the work of removing the burned hulk of the steamer Eliza H. Strong, which lies about a mile off the harbor of Lexington, Lake Huron.

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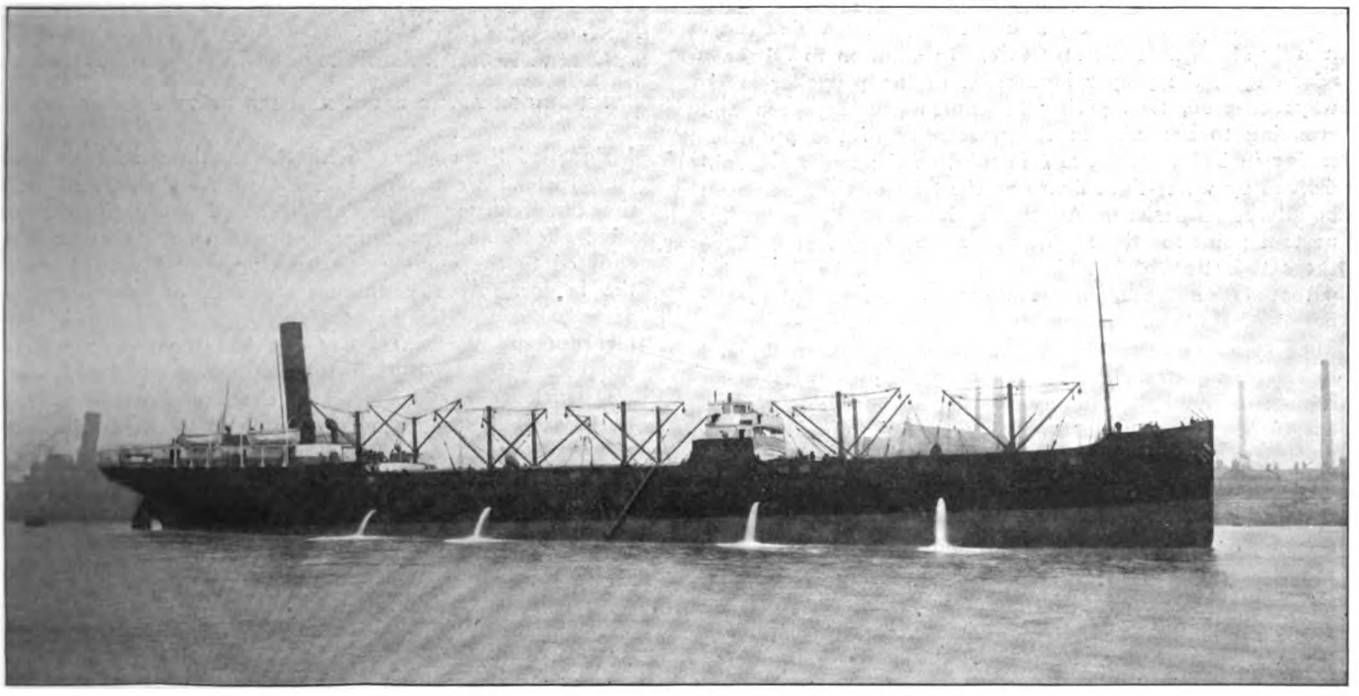
English Type of Bulk Cargo Carrier.

The firm of Sir Raylton Dixon & Co., Ltd., Cleveland dockyard, Middlesbrough, England, have just designed and built an improved type of steamer for ocean service with cantilever transverse framing and topside tanks with absolutely clear holds and enormous hatchways. One of these vessels, the Chr. Knudsen is now at Montreal under charter to the Dominion Coal Co. and invitations have been sent by the firm of Sir Raylton Dixon & Co. to the ship builders of the great lakes to inspect her. From the following description, furnished by our Liverpool correspondent, and the accompanying views, it will be seen that she closely resembles the latter-day ore carriers on the great lakes, especially in the girder system of construction. She is also one of the first ocean-going steamers we have seen to have her engines aft—a practice which has been continuously followed on the great lakes since 1867.



CARGO HOLD OF STEAMER CHR. KNUDSEN.

Shipbuilders have ever to be on the alert to be able to present to shipowners the most suitable and economically worked vessel, and with this object in view, to meet the demand, especially in the keen competitive times that are now prevailing, the enterprising firm of shipbuilders, Messrs. Sir Raylton Dixon & Co., Ltd., of Cleveland dockyards, Middlesbrough-on-Tees, have recently laid themselves out for the building and construction of a truly remarkable type of vessel, which will undoubtedly supersede the best and latest of novel types. Already three vessels of the type have been constructed by these builders, but this notice particularly refers to the most recent of them, the steamship Chr. Knudsen, just delivered to her owners and here illustrated. Considering this ship from the various standpoints, shipowners have now placed before them a ship so designed and arranged as to exactly suit many trades with the minimum net register tonnage combined with maximum water ballast, large deadweight carried on shallow draught and enormous



STEAMER CHR. KNUDSEN SHOWING UNLOADING DERRICKS.

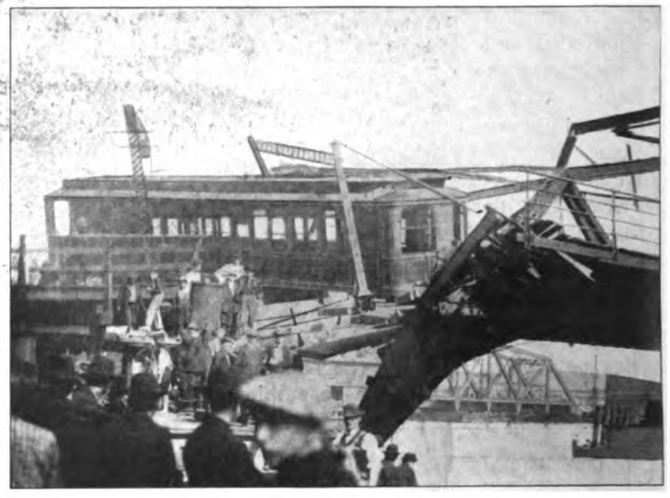
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hatchways, or in other words, an "ideal" ship from a remunerative point of view. The design is on what is called "Harroway & Dixon's Patent Cantilever Frame System," and although the steamship Chr. Knudsen is 360 ft. long, over 51 ft. beam and 29 ft. deep, she is a pure single decker, with absolutely no beams, wide stringers, web frames or pillars in the holds, providing thereby holds absolutely free from any obstruction whatever between the deck and tank top ceiling. The advantage a vessel of this description affords over the ordinary type of single deck with holds beams, and with one, two or possibly three rows of pillars, is very obvious where handling and carrying large, bulky cargo is concerned, such as machinery, timber, packages, etc. Within the structure of the cantilever frame, inclining inwards below the deck on both sides of the ship, the space is utilized for a threefold purpose; firstly, it is so enclosed as to form watertight tanks on each side of the ship, all fore and aft, and in these tanks water ballast is carried, which is pumped up in the ordinary way, and discharged overboard by simply opening from the deck, sluice valves on the shell of the ship; secondly, the angle so formed by the sloping sides of the holds makes the vessel a complete self-trimmer, superior to any self trimmer hitherto produced; thirdly, these tanks when empty afford a much greater reserve of buoyancy and act exactly like the air tanks of a life boat, ensuring much greater reserve of buoyancy, so that if one of the holds should be pierced, she would still float, and from this it would appear that a vessel of this type should appeal to underwriters through the extra safety. This type of vessel meets the ever increasing demand for sufficiency of water-ballast in seagoing steamers in light condition, for the total quantity that can be carried is about 75 percent above that in the ordinary steamer. Apart from this, the water ballast and the tanks are so distributed that instead of being a source of weakness to the ship, as a deep chamber ballast tank, is when filled, the fore and aft tank along each side of the vessel constitute very strong box girders, which enormously strengthen the structure. In addition to all these advantages, the proper immersion of the propeller is always ensured, thus giving her much greater speed and reducing to a minimum the possibility of the propeller racing in bad weather, and further, as the tanks are subdivided by water-tight divisions the trim of the vessel can be altered as desired. Another and perhaps the most important point for the shipowner is that they further have the satisfaction of knowing that owing to the particular patent design the topside tanks are not included in the board of trade measurements for the British tonnage or Suez canal certificate, like the ordinary deep tank, and hence the dead weight carried in proportion to the net register is more than in any existing steamer, and may be as much as over three tons of dead weight per ton net register. The steamer Chr. Knudsen has eight hatches, all of the enormous width of 30 ft. with ten derrick-posts, double derricks at each, making twenty in all, and with a suitable number of winches to each post. The arrangements at the port of loading, namely Sydney (Nova Scotia), are capable of loading about 7,000 tons in less than seven hours, and at Montreal can discharge this in about the same time. The engines are placed right aft in the vessel and have cylinders 26, 42 and 70 x 48 stroke, supplied with steam by two large single-ended boilers, fitted with Howden's system of forced draft, working at 180 lbs. pressure with an indicated horse-power of 2,000. The Chr. Knudsen is under charter to the Dominion Coal Co., Ltd. of Canada, to be employed seven months in the year in their trade between Sydney (N. S.) and Montreal.

ACCIDENT TO A MILWAUKEE BRIDGE

In a remarkable collision with the East Water street bridge at Milwaukee recently, the Canada-Atlantic liner Kearsarge demolished one end of that structure and narrowly escaped hurling a street car containing twelve passengers into the river from the other end. Only one man, a passenger, who attempted to jump from the car, was injured, and he was only slightly bruised. The Kearsarge was not damaged. The collision is said to have resulted from the misunderstanding of the captain's signals by the engineer, and the matter is being investigated by the line officials. Navigation was tied up for eight hours as a result of the collision, and the Goodrich line of passenger boats was obliged to miss one complete round trip to Chicago.

"I was on the bridge at the time of the accident," said Capt. John McNeill. "The Gratwick was just ahead of us and went through the bridge, which was then closed on us to allow the cars and foot passengers to cross. We were lying about 100 ft. from the bridge when it closed. After the car had gone about half way across



THE BRIDGE AFTER BEING RAMMED BY THE KEARSARGE.

I signalled the engineer with the small whistle, to back up. Instead we moved forward. I then signalled with the Chadbourne telegraph, full speed astern. Still we went ahead, and some one ran to the engine room and shouted to the engineer to back up, as we would strike the bridge. At the time of the collision we were reversed, but the boat was traveling under its own momentum and the wheel had not had time to check its progress. If we had been going at full speed ahead when we struck we would have gone clear through the bridge. If the car had stopped on the middle of the bridge instead of trying to get clear, there would have been little trouble."

PERSONAL

L. C. Sabin of Sault Ste. Marie has been appointed secretary of the International Waterways Commission.

Jos. Ripley, superintendent of the Sault Ste. Marie canal, will leave for Panama in September as a member of the board of consulting engineers.

Capt. F. M. Munger, who has had charge of the life-saving service on the coast of California for a long time, has taken command of the revenue cutters in Puget Sound and will endeavor to prevent smuggling and the immigration of Chinese and other undesirable persons. Capt. H. B. Rogers, master of the revenue cutter Thetis, takes command of the life-saving department and Capt. F. M. Dinwiddie comes from Washington to command the Thetis.

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POWERFUL MERSEY DREDGER

One of the most powerful dredges of her type yet built was launched from the yard of Messrs. Ferguson Bros. of Port Glasgow on Oct. 11, last, and has just recently been delivered. She is named the Vulcan and her dimensions are as follows: Length, 207 ft.; breadth, 41 ft.; depth, 14 ft. (moulded). She is capable of dredging 1,000 tons per hour from 56 ft. below water level. The design of the dredger, which embodies several special features, was prepared by the builders to meet the requirements of the Mersey Docks and Harbor board for deep dredging in hard material, and for working close up to dock and quay walls. She is capable of cutting her own flotation, and of dredging in any depths from flotation level down to 56 ft. The bucket ladder projects in advance of the hull a distance sufficient to enable the vessel to dredge close up to dock and quay walls when buckets are lowered to a depth of 48 ft. The bunkers have a capacity of 100 tons, and the fresh-water tanks of 50 tons. The vessel has been built throughout under Lloyds special survey to class 100A.1. The hull is subdivided into fourteen watertight compartments. Side chutes are arranged for discharging the dredged material over either side of the vessel into hopper barges, the lifting and lowering of each chute being done by an independent engine. The regulation of the dredgings to either side of the vessel is controlled by a strong flap valve door fixed at the apex of the chute, and worked by gear from the main deck. Steam steering gear is fitted at the after end of the engine casing, controlled from the wheelhouse, which is placed on the highest point of the dredger at the top of the main gear framing. A complete installation of electric light is fitted throughout, large arc lamps being placed on deck for night work. The main engines, which are employed for either propelling the vessel or driving the dredging gear, consist of two sets of triple-expansion, capable of indicating 1,250 H. P. Steam is supplied from two cylindrical return-tube boilers. The gearing is arranged to work the buckets at two different speeds, according to the nature of the material being dredged. The dredger buckets and links are of a special strong design for working in hard material and each bucket has a capacity of 21 cu. ft. A large steam crane is fitted on deck for overhauling the buckets and links and for general purposes. Powerful steam winches are fitted at bow and stern for manipulating the mooring chains and holding the dredger up to its work. The Vulcan on her trials attained a speed of 8½ knots, which is half a knot in excess of the contract stipulations.



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REPAIRING THE TOMLINSON STEAMER "SYLVANIA" AT THE YARD OF THE CHICAGO SHIPBUILDING CO., SOUTH CHICAGO, ILL.

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GENERAL PANDO HOODOO

By E. Cockburn Johnstone.

It is astonishing with what persistency bad luck will follow a man, but it is not less so in the case of ships. I well remember being an eye witness of the launch on the Clyde, some twenty odd years ago, of the ill-fated Daphne, when scores of lives were lost, and watched her through many subsequent misfortunes until Davy Jones claimed her as his very own. I have followed the careers of several other unfortunates since then, but the case of the General Pando, which came under my immediate notice, while not offering anything serious in the way of disaster will, I think, be hard to beat for insistent consistency.

Bolivia has long been desirous of deciding that portion of the dividing line between that country and Brazil, lying along the upper reaches of the Madeira river, but, for reasons with which we are not here concerned, Brazil has not shown any feverish anxiety about the matter, and consequently the major portion of activity has been demonstrated on the side of Bolivia.

An expedition to determine the true course of the Maderia river and its many tributaries was formed, and with a desire for neutrality an Englishman by the name of Satchell, was appointed head of the commission.

A light draught twin screw boat about 60 ft. long was constructed and set out for this purpose, but was ultimately found to be of too limited dimensions to carry the outfit, and a much larger vessel capable of carrying provisions for a long period, was found necessary, and in consequence Sir Edward Read, K. C. B., M. P., formerly chief constructor of the British navy, who as engineer for the crown agents for the British colonies had a large experience in light draught steamers, was called in and given the work of designing a suitable vessel.

As is often, if not invariably, the case where governments are concerned, especially when they are not equally interested, much delay was occasioned, and almost two years elapsed before a decision was arrived at, which practically amounted to this: Bolivia was to undertake the entire carrying out of the work of the commission, to have a suitable vessel constructed and everything to be ready by a given date. But as I have already said, much delay took place, and only six months remained wherein to build the vessel, pack her for shipment, and re-erect her at Para or Manaos on the River Amazon, and here the trouble began.

A noted firm of builders of light draught steamers, Messrs. Cockran & Co., Ltd., Annan, Scotland, of which the writer was manager, secured the contract and much activity was displayed to expedite the progress of the work, and in a few weeks the vessel was in frame. By the merest chance the writer, during a conversation with Mr. Satchell, discovered that the boat under construction could not by any possible means carry the great amount of gear which he expected her to, and in consequence the work had to be held in abeyance until the matter could be adjusted.

The tortuous windings of the rivers restricted the length and breadth of the vessel, the shallows of the upper reaches determined the draught, the currents made a speed of twelve miles imperative to make headway, and the time required to carry out the exploration necessitated the carrying of much provisions and the outfit, without which the expedition would be worse than useless.

With these almost insuperable difficulties in view it was decided to increase the length and breadth and proportionately increase the power to insure the desired speed, and to lighten the structure as much as possible, consistent with strength and thereby enable the requisite amount of provisions and outfit to be carried. This adjustment naturally consumed much of the limited time at the disposal of the commission, and the work was again proceeded with with renewed vigor.

The General Pando, as she was named, was quite a sumptuously appointed vessel, well equipped and replete with everything for the comfort of the commissioners. The leader and engineer of the party were accommodated in beautifully furnished quarters on the upper deck and the officers and crew were provided for in quite unusual fashion for a vessel of this type, shower baths and lavatories of the most approved types, mechanical swinging punkahs and revolving fans, sending streams of cold air through tubes to each room. A huge refrigerator and storage chamber, awnings, curtains, hammocks, and everything conceivable for comfort was provided, so that it will be easily seen that all these things stand out in strong contrast, when compared with the methods of other days, when carrying of provisions was accomplished by natives — canoes of most primitive design and cramped and squalid as regards the accommodation, were the only means of transit, and where the luxury of a spray bath was an unknown quantity and ice water an impossibility.

Perhaps I should have mentioned that the vessel was constructed in floatable sections, and as the contract called for trials afloat everything had to be erected in a temporary manner, but of sufficient strength to enable the trials to be gone through with, and so everything being ready the ship cradle on which she had been constructed was lowered into the water and gay with bunting, the General Pando was gently floated off. The tide in the Riven Annan has a rise and fall of about 12 to 14 ft. during springs, and on the afternoon in question the tide was an unusually high one, overflowing the banks and flooding the fields on either side. It had been arranged that as soon as she was afloat and free from the cradle, the first order from the bridge, slow astern, would be sent by messenger, which was duly performed and carried out, but for some reason which, in the confusion that followed has never satisfactorily been explained, the order by telegraph "Stop," was misread or misunderstood or something, for "Full speed ahead," and amid the shouts of the captain, crew and officials on board and ashore, and the consternation of the 1,000 people who were witnessing the event from the river side, the newly-fledged ugly duckling, for stern wheelers can seldom be termed graceful, sailed clean over the bank, and stuck fast with her nose high up in the adjoining field.

The tide was just turning and the combined efforts of machinery, winches, tackles and men were of no avail to refloat her until about two hours' ebb, when lying at an angle of about 45 degrees, with her spoon-shaped bow high up above the bank and her stern wheel almost out of sight and everything seemed to point to certain destruction, with a graceful sinuous glide she re-entered the water.

Everything now being ready for dismantling, a difficulty which had for some time been threatening, now fully uncovered itself. There are only two steamship lines sailing out of Liverpool to the Amazon, capable of carrying the parts of a vessel of the size of the General Pando, but they are so bound up in interests that it practically amounts to a monopoly and a fabulous sum was asked for transhipment.

With this in view and the great sum also demanded for re-erection on the Amazon, Bolivia's minister plenipotentiary at London, in whose hands the final disposal of all matters rested, was at his wit's end, because only a few months remained until the expiry of the time stipulated, and grave fears were entertained that Brazil might

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take advantage of the breach of contract to step aside from her part of the agreement.

Many and varied were the proposals made to obviate these difficulties and amongst others the writer suggested that she be towed. Now the question of towing a flat-bottomed vessel, built in sections and bolted together, across the South Atlantic was a novel, if not to say startling one, and raised quite a storm of adverse comment, and was characterized as an impossibility by many of those concerned, but when the method proposed was fully grasped and the possibility became more apparent, much of the fear was set aside as being groundless. The scheme consisted in enveloping the hull and machinery with a wooden cradle, and this was done without a single fastening going through the hull of the vessel.

This fact alone was considered the most important and difficult one to overcome, as in the case of the cradle—which was intended mainly for stiffening the light hull structure, being fastened through the hull, and the slightest working of the hull inside the skeleton cradle to take place, the plating, which was in places less than ⅛ in. in thickness, would surely have given way and leakage at every through fastening was likely to ensue, therefore, the chief point in the construction of the cradle was that no fastening should go through the hull.

Owing to the fact that a vessel of this kind had never been towed before, it was found to be a most difficult matter to induce underwriters to insure her for the voyage, but finally after many experts had given the highest praise in their endorsements of the scheme, everything was satisfactorily arranged and early in August, under excellent weather conditions, the General Pando started on her long voyage in tow of a tug.

And here again ill luck pursued her, as swinging out of the River Annan into the Solway firth, against the flood tide, the new hawser with which she was being towed, parted without the slightest warning, and only by prompt action on the part of the crew of the tug was she saved from positive destruction by impact with the Solway viaduct, toward which she was speeding at the rate of ten miles an hour. A crew of four men, consisting of a captain and mate, carpenter and an engineer to work the steam pumps in case of emergency, had been placed on board, and as we waved a final farewell to them as they were being towed away, we hoped that at last we had rid ourselves of what Americans call a hoodoo. At that time of the year vessels generally encounter the most beautifully calm weather on the passage to Madeira, but not so the General Pando. Her ill luck was still following in her wake, as after getting safely across the Bay of Biscay she encountered a tremendous gale that was almost too much for the sea-going tug that escorted her and from which she had to part company, and tossed and battered about helplessly by the turbulent sea she foundered forty miles to the west of Vigo.

In broad daylight, within view of the Spanish coast, head foremost and her stern girders high in the air, she remained a few moments before taking a final plunge, leaving her crew struggling in the water, from whence they were with much difficulty rescued by the tug, only to find, however, that Captain Purdy, who was a man of long seafaring experience, had given up his life in the struggle.

But this wasn't all. Litigation over the insurance followed, and for all I know the rival countries of Bolivia and Brazil are probably still wrangling over the boundary line, which was not determined by the unlucky General Pando.

A BRIEF HISTORY OF CRANE CO.

In the spring of 1855 Mr. R. T. Crane came to Chicago and, after looking over the field and advising with his uncle, the late Martin Ryerson, opened a brass foundry in the corner of the latter's lumber yard. Work on the shop was completed July 3. Being anxious to see how the furnace and sand would work, and having some patterns ready, Mr. Crane took off a heat the next day, notwithstanding it was the Fourth of July. The sand used was found on the premises, and the first castings were couplings used in connecting lightning rods. Business prospects looking good, Mr. Crane sent for his brother, Charles S. Crane, who came in the fall, and who was connected with the business until 1871. Shortly after his arrival they decided to go into the making and finishing of brass goods. A foot lathe was purchased, and the manufacture of brass engine trimmings begun. A few months later a room with power was rented, and the following spring a small three-story frame building was erected and equipped for power with a 6 H. P. portable engine. The next year jobbing in wrought iron pipe and fittings and steam warming work was taken up.

Little business was done in the three years previous to the breaking out of the civil war, because of the unsettled conditions prevailing. After the breaking out of hostilities the enormous demand of the government for all sorts of material created a boom in business generally. Soon the brass plant had to be enlarged, and the manufacture of brass globe valves, check valves, steam and gas cocks begun. An iron foundry was started, and the building, in a small way, of machinery and the making of a few articles belonging to the steam-fitting line was undertaken. About the same time a small butt-weld pipe mill, the first mill west of Pittsburg, was built on ground where the Crane Co. still has a pipe mill. In the same year (1864) the property where the present brass department is located, known as No. 10 North Jefferson street, was purchased and the first malleable iron foundry outside of the eastern states started. This foundry was on the second floor and is said to be the first instance of a foundry being placed above the ground floor. The manufacture of both malleable and cast iron fittings was commenced. The fitting industry was then in its infancy in this country. Most of the fittings used were wrought iron fittings imported from England. Not more than six or seven concerns were in the business in the United States and their total output was small. About this time the three-way tapping machine was invented. Two, with some original improvements, were built by the Crane Co. and installed in their shops, one for tapping ¾-in. and smaller, the other for tapping 1 to 2-in. The few fittings required above 2 in. were threaded in a lathe. In connection with the fitting business the company early took up the manufacture of dies and die plates.

In 1865 the business was incorporated by Richard T. Crane, Charles S. Crane, Martin Ryerson, Eliphalet W. Blatchford, Charles N. Holden, and the name changed from R. T. Crane & Brother to the Northwestern Manufacturing Co. This name was retained until 1872 when the title Crane Brothers Manufacturing Co. was adopted, which was changed in 1890 to Crane Co.

By 1870 the business had grown so that further extensions were necessary. The land west of the property at No. 10 North Jefferson street was purchased and a building erected thereon. Fortunately the company escaped the big fire of 1871, and the large increase that had recently been made in facilities enabled the company to take advantage of the heavy demand for goods created in the re-building of the city.

In 1881 another pipe mill was erected on property purchased on West 12th Place, where there were excellent railroad facilities. One lap-weld and two butt-weld furnaces were erected. In this mill a Siemens gas furnace was em-

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ployed in the manufacture of lap-weld pipe. Some years later the machinery in this mill was transferred to a mill in Pittsburg and ultimately was sold to another concern. The mill was then re-built, and the malleable iron and gray iron fitting departments were transferred to it, leaving larger space in the old buildings for the brass shop.

Although the Crane Co. was concentrating upon the manufacture of valves and fittings, the continued growth of the business demanded extensive additions in 1891, 1899, 1900, 1902, 1903, and this year a five-story modern office building has been erected. Not only has there been an immense increase in the floor space used for manufacturing purposes, but all departments have been equipped with the latest improved machinery, much of which has been designed and built by the company.

As early as 1857 the company entered the steam warming field, and the next year had a contract for the steam warming of the court house at Chicago. At different times the company manufactured heating coils, wrought iron pipe radiators, cast iron radiators, and ventilating fans. Believing that it was not fair for the manufacturer to compete with the trade to which he was selling, the company retired in 1874 from the steam warming contract business. At the time the company went into the business very few buildings were equipped with steam-heating apparatus. Many improvements were made in these appliances by the Crane Co.

Elevators were made by the Crane Co. as early as 1867, and the business grew so rapidly that it was soon crowding other work out of the machine shop. In 1870 the manufacture of passenger elevators was commenced. In 1886 the elevator part of the business was separately incorporated as the Crane Elevator Co. and given a complete plant by itself. The Crane Co. and the Crane Elevator Co. brought out and introduced ten different types of elevators and did much towards developing this line of machinery. With a view to concentrating on the valve and fitting business, in 1895 the Crane Elevator Co. was sold. While Otis Tuft, of Boston, was the first builder of passenger elevators in this country, and was followed very closely by Otis & Co. of New York, the Crane Co. took up these lines so soon after these firms that the company should be considered as a pioneer in the industry.

The growing demand for air-brake parts led the company to undertake their manufacture, and by 1891 a full line of parts was carried. At the Columbian Exposition, 1893, the company exhibited a complete air-brake equipment. The general business of the company was developing so rapidly, however, that the air-brake business, being a distinct line in itself, was abandoned.

About 1865 the company took up the manufacture of pulleys, shafting, steam engines and steam pumps. A Corliss engine built by the company in 1879 was installed in the factory building at No. 10 North Jefferson street, and has been in continuous hard service from that time to this day. Immediately after the great fire Mr. Crane offered to put several Crane pumps along the river and force the water through the city mains. His offer was acepted, and the water thus pumped was the only fire protection the city had until the city water works was again in operation. At present the Crane company does not manufacture machinery for sale. The company has, however, a machine designing department and a machine shop, in which is built the special machinery needed in the business.

The company has from its infancy constantly added to the varieties and sizes of the products manufactured. Some of the important classes of goods put on the market in more recent years have been stationary, marine and locomotive pop safety valves, drainage fittings, extra heavy brass and iron valves and fittings, hydraulic valves and fittings, ferro-steel flanged fittings and valves, ammonia fittings, steam traps, steam and oil separators, malleable and ferro-steel companion flanges, electrically and hydraulically operated and steam actuated valves, and a complete line of flat band fittings. In addition the company is prepared to turn out complete piping equipments for power plants, and has facilities for bending and threading all sizes of pipe, and screwing, welding or rolling flanges on it. All told the company manufactures in excess of 10,000 articles for use in connection with steam, water, gas or air. Persistent effort has resulted in greatly improving both the design and quality of the products manufactured.

A sketch of the Crane Co. would not be complete without a description of the growth of its branch house system, which, by ensuring large and steady sales enabled the company to devote its resources and energies to a single line of manufacture with the consequent result of being able to use highly specialized automatic machinery.

The first Crane Co. branch was established in 1886 at Omaha. One year later branches were opened in Los Angeles and Kansas City. The success of these branches led to the determination to start others and make branch houses a permanent and important feature of the business. The branch houses carry stocks enabling the customer to get goods promptly and be assured of receiving uniform articles. In 1890 the first Eastern branch began business in Philadelphia Other branches have been established in the following cities: San Francisco, 1891; Minneapolis, 1892; St. Paul, 1893; New York, 1894; Portland, Ore., 1894; Duluth, 1894; Sioux City, 1897; Oakland, Cal., 1898; Cincinnati, 1899; St. Louis, 1899; Salt Lake City, 1902; Seattle, 1902; Watertown, S. D., 1903; Chanute, Kan., 1903; Independence, Kan., 1904; Spokane, 1904; Fargo, N. D., 1904; Baltimore, 1904; Memphis, 1904; Dallas, 1904, and Birmingham, 1905. All the branches except New York carry complete stocks of plumbing supplies. The Chicago sales department, conducted in connection with the general offices, does not handle plumbing material.

While no special effort has been made to create a demand for Crane goods outside of the United States and their possessions, for the reason that the capacity of the company has been fully taxed in taking care of domestic demands, nevertheless they are sold in considerable quantities in Canada, Great Britain, Denmark, Mexico, South America, South Africa, Australia, Japan, China and Russia, and in smaller quantities in all countries of the world. The company was awarded the only gold medal given at the Paris Exposition, 1900, for exhibits of valves and fittings. Recently a European sales office and showroom has been opened at No. 95 Queen Victoria street, London, E. C.

The Baltimore & Ohio R. R. has placed an order with The Baltimore Shipbuilding & Dry Dock Co. for a steel harbor tug which is to be a duplicate of the Geo. F. Randolph. The tug is intended to tow coal boats and lighters and will be 118 ft. long 23 ft. beam and 12 ft. 5 in. deep. The machinery will consist of fore and aft compound engine with cylinders 20 in. by 40 in. in diameter and 28 in. stroke supplied with steam from one Scotch boiler 14 ft. in diameter 12 ft. 6 in. long.

The steel tug Monocacy, built for the Philadelphia & Reading Railroad Co., was successfully launched from the yard of the Maryland Steel Co., Sparrows Point, Md., last week. She is 170 ft. long, 29 ft. beam and 18 ft deep.

Supervising Inspector General George Uhler of the steamboat inspection service, is making a tour of the country looking over the steamboat inspection officers. He will continue his journey to the Pacific coast.

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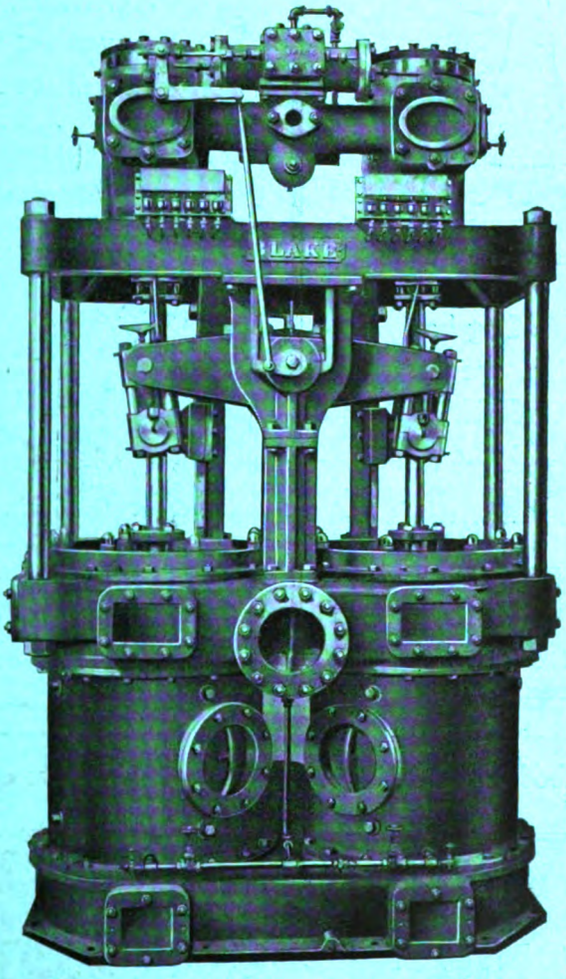
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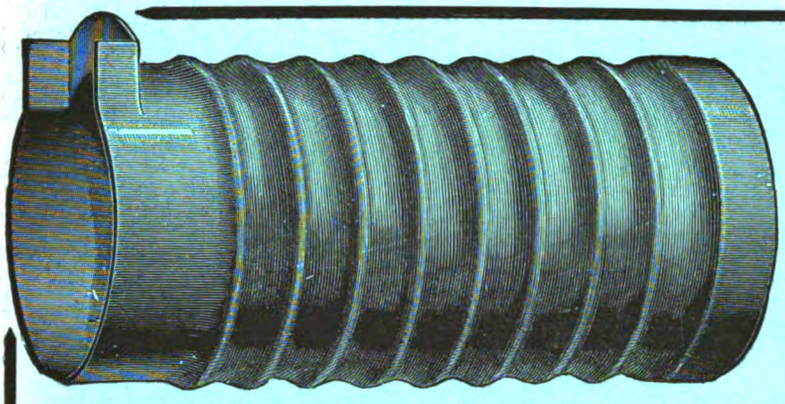
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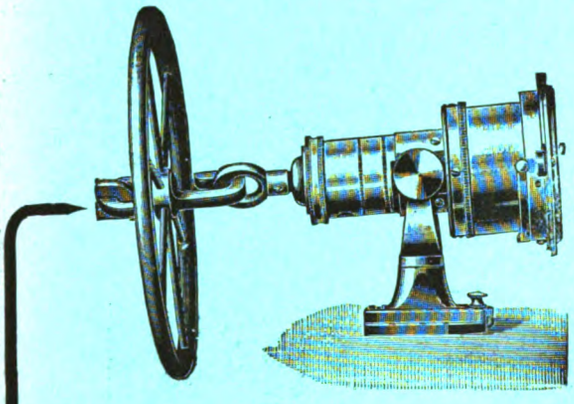
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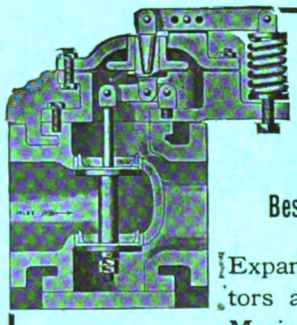
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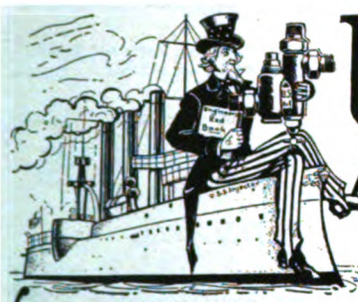
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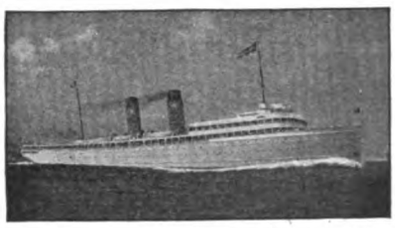
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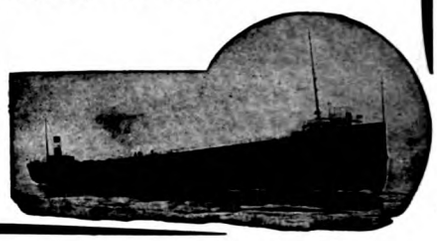
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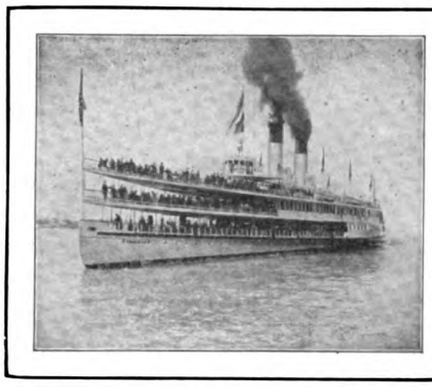
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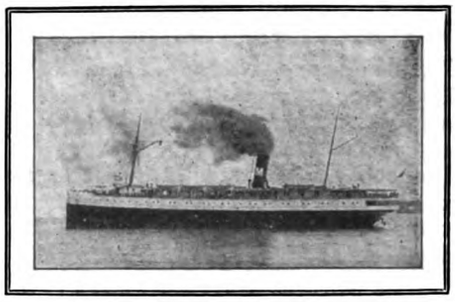
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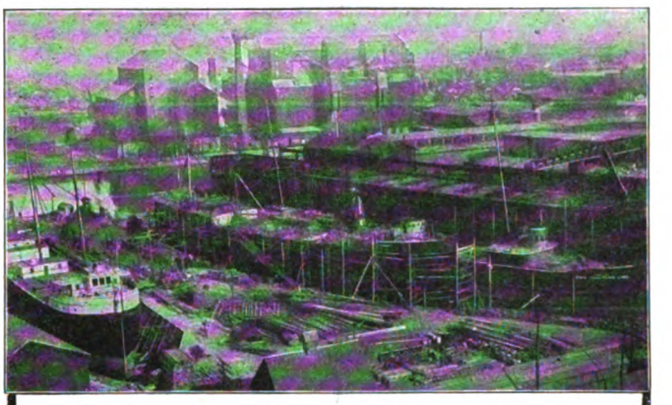
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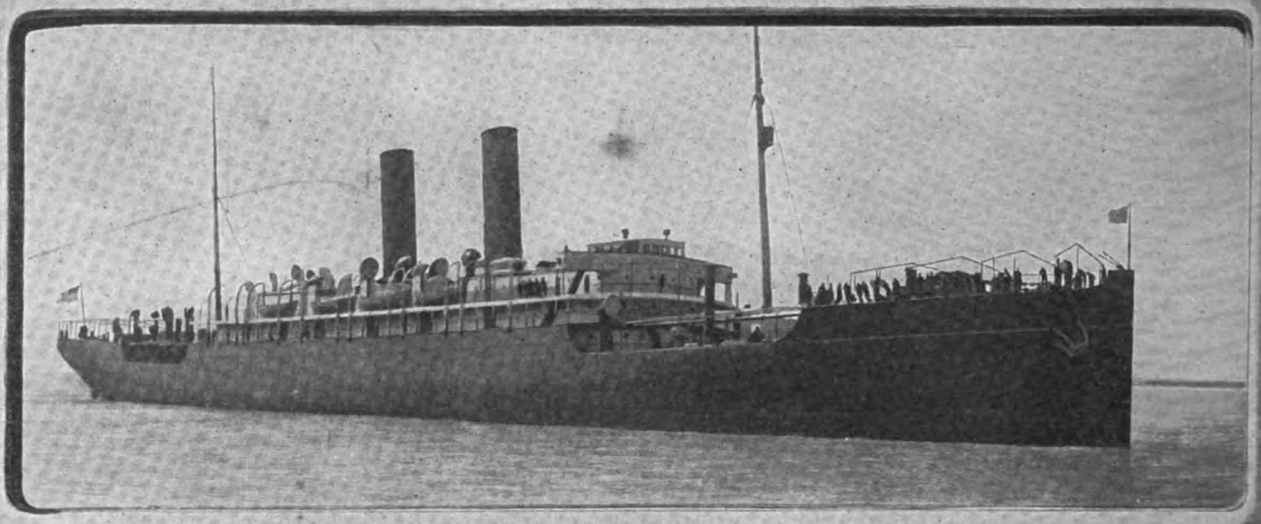
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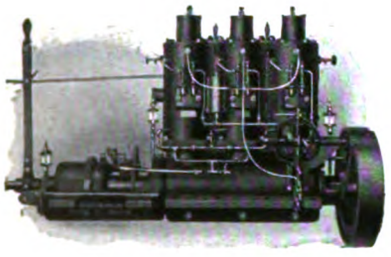
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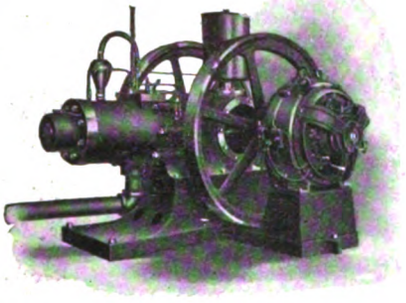
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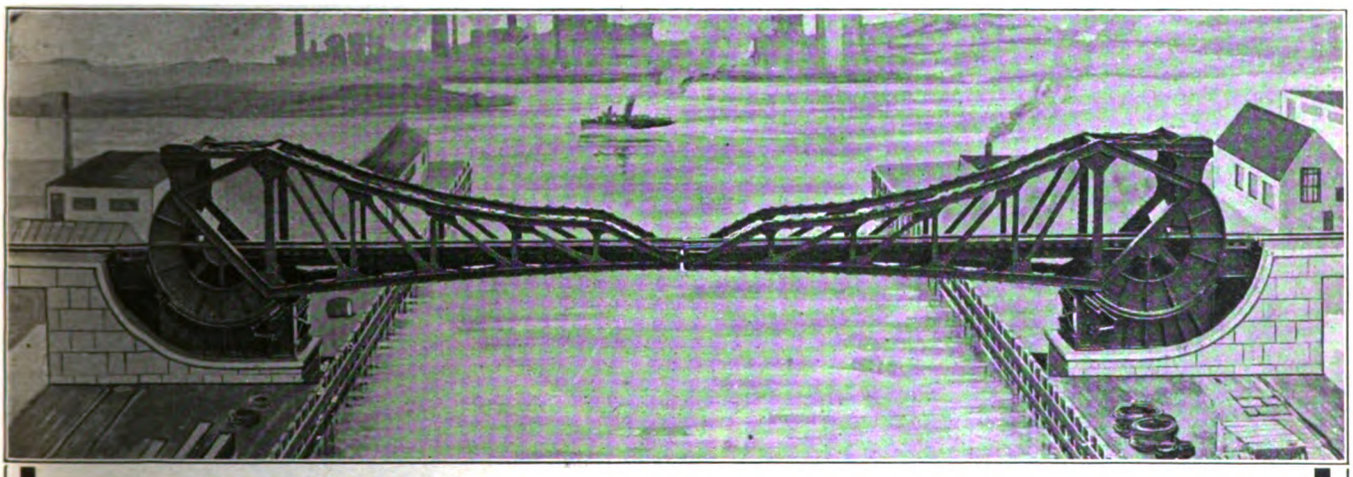
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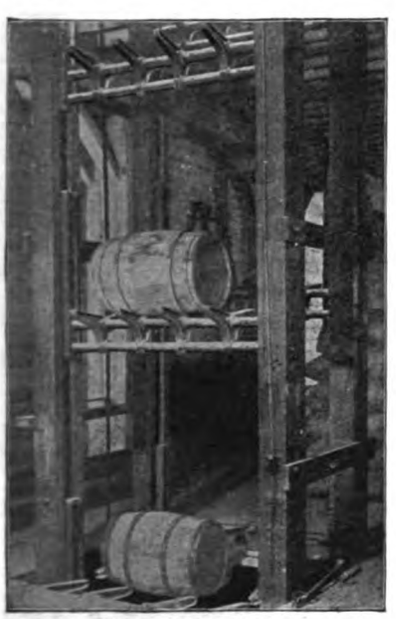
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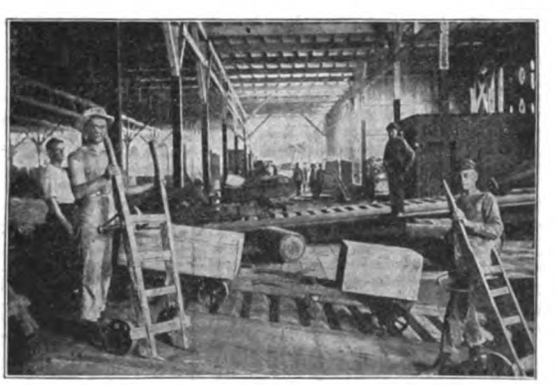
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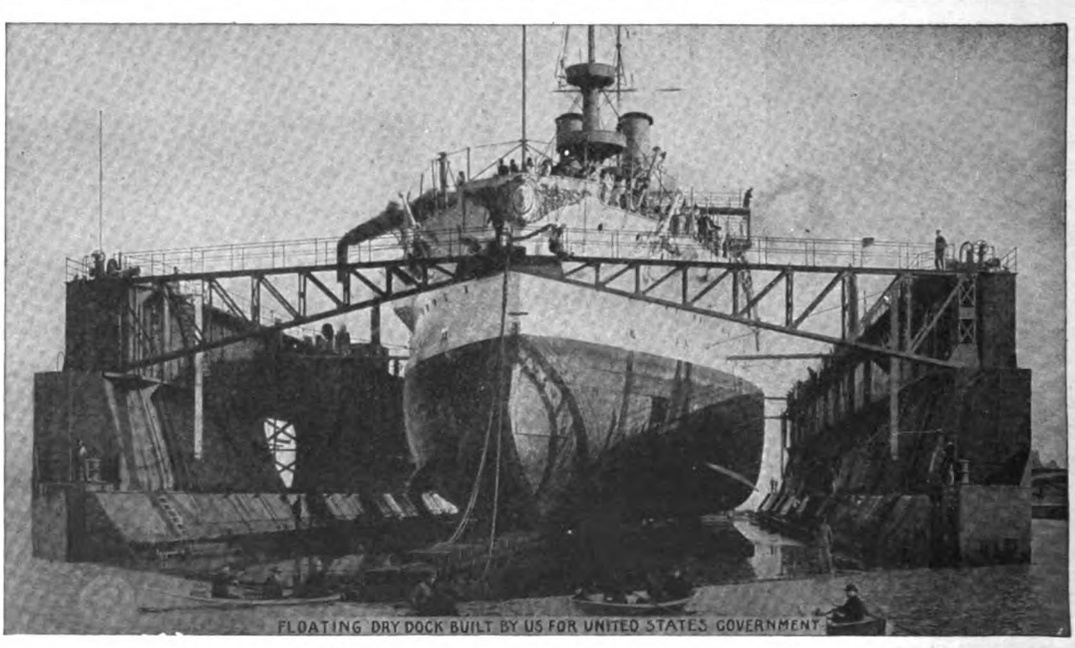
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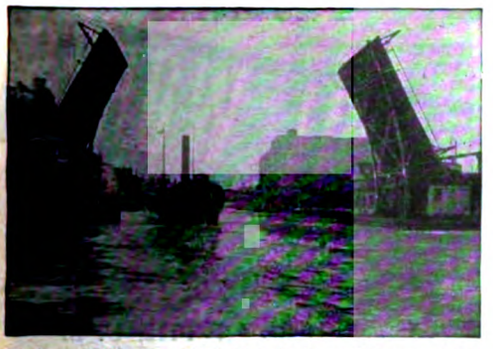
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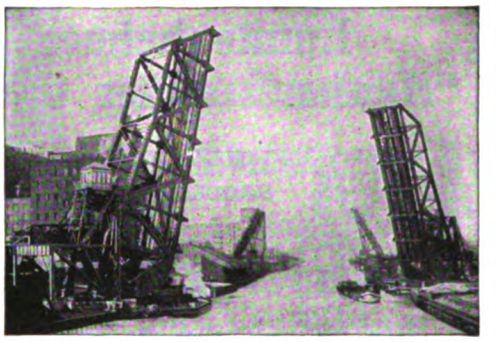
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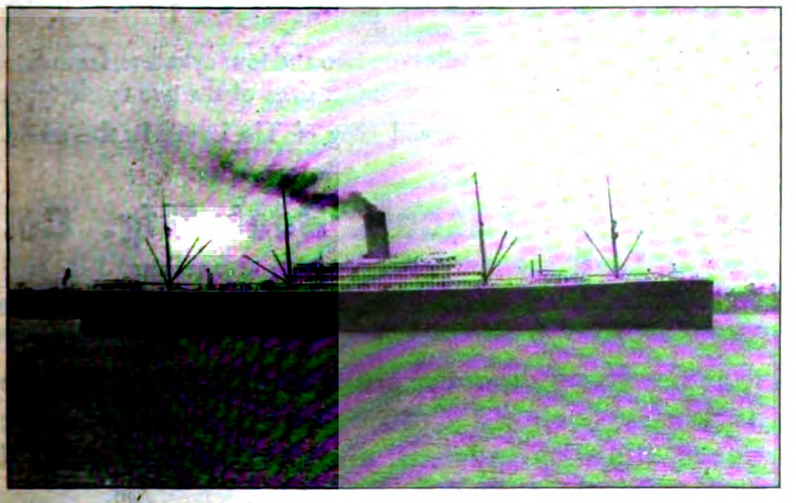
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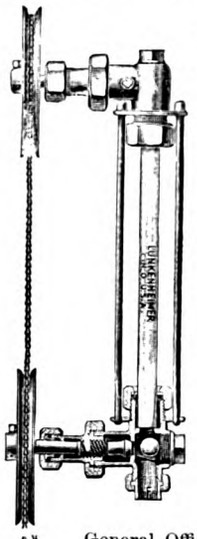
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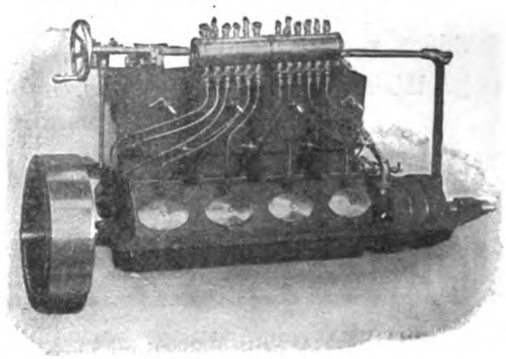
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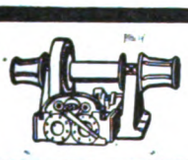
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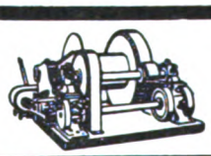
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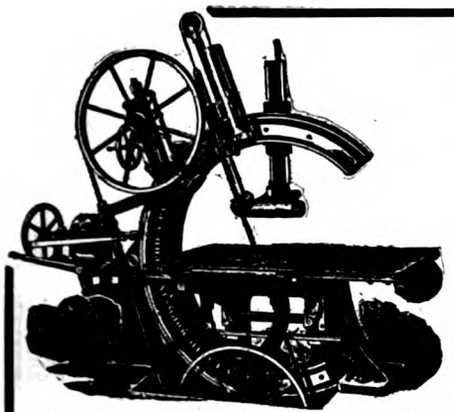
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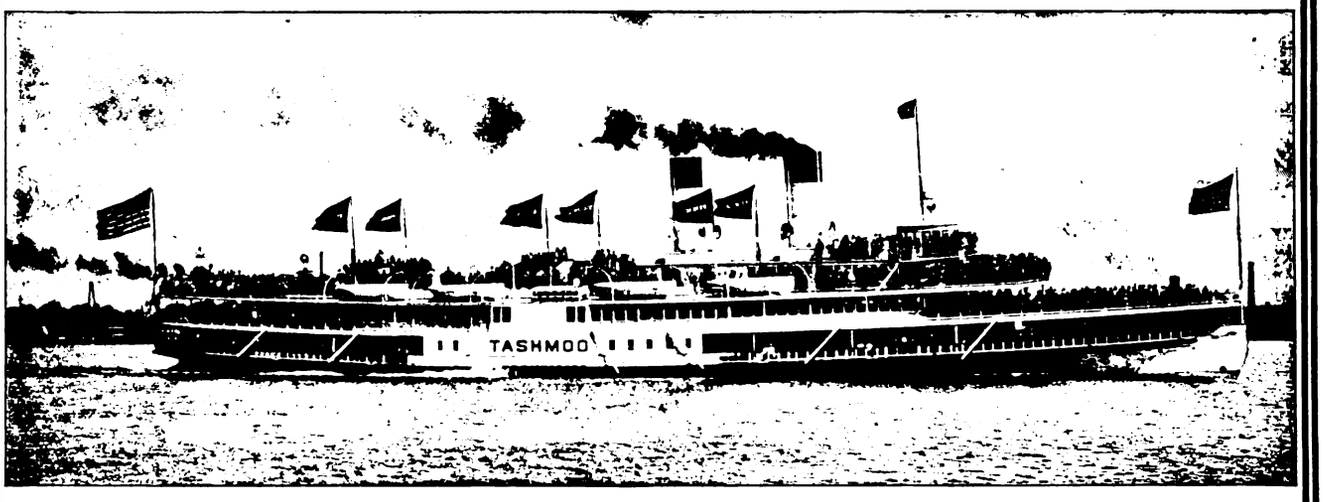
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Str. North Land at the Dock.

SAULT STE. MARIE, MICH.

Locking a Big Steamer.
Locks showing high and low level.
The Locks.
General View of Locks from Offices.
Poe Lock, from below, closed.
Poe Lock, from below, open.
Poe Lock, from above.
Poe Lock, with Whaleback.
Whaleback Str. Pathfinder in the Locks.
St. Marys River, South from the Locks.
Weitzel Lock, from above.
Weitzel Lock, from below.
Str. North Land Passing Locks, two views.
Upper Entrance to Lock Canal.
Gate Mechanism.
Interior of Power House.
Canadian Lock from Upper End.
Canadian Lock from Lower End.
Steamers Entering and Leaving Poe Locks.
The Rapids, looking up.
The Rapids, looking across.
Indians fishing in the rapids.

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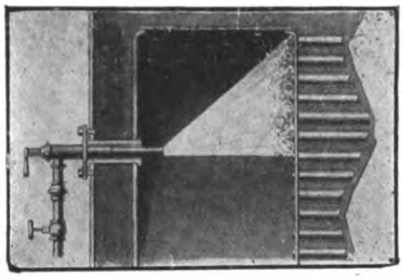


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Accept our offer to loan it to you for a thirty days' free trial. Such trial obligates you in no way to buy.

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THE TROUBLE MAKER

Get rid of it—Stay rid of it. The quickest, cheapest and most simple way is with the

Diamond Flue Blower



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THE STANLEY B. SMITH COAL AND DOCK CO.,
TOLEDO HARBOR, TOLEDO, OHIO.

1,800 Feet of Dock. 6 McMyler Derricks. Capacity 3,000 Tons Daily.

Fuel Lighters.—"KANAWHA." "PENNSYLVANIA." "HOCKING."

Docks.—PENNSYLVANIA R. R. HOCKING VALLEY R. R. TOLEDO AND OHIO CENTRAL R. R.

SMITH'S COAL DOCK, Detroit River, DETROIT, MICH.
12 Pockets. Platform. Low Dock.

Operated by STANLEY B. SMITH & CO.

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GENERAL OFFICE, LAKE DEPARTMENT, PERRY-PAYNE BUILDING, CLEVELAND, OHIO

Steamboat Fueling Facilities at Various Points on the Great Lakes

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Pintsch Gas Lighted Buoys
BURN CONTINUOUSLY

FROM 80 TO 365 DAYS AND NIGHTS WITHOUT ATTENTION AND CAN BE SEEN AT A DISTANCE OF SIX MILES.

Brilliant & Steady Illumination. Economical & Reliable in Operation.

Adopted by the English, German, French, Russian and United States Light House Departments for Channel and Harbor Lighting; over 1800 gas buoys and gas beacons in service.

Controlled by the

SAFETY CAR HEATING & LIGHTING COMPANY
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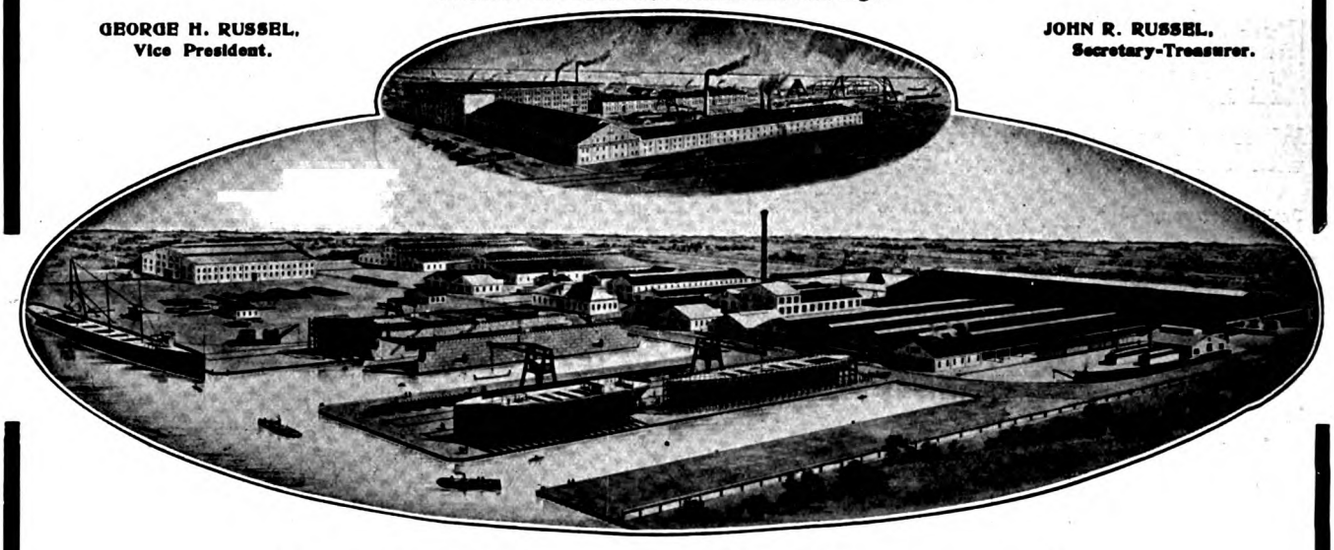
GREAT LAKES ENGINEERING WORKS

DETROIT, MICH.

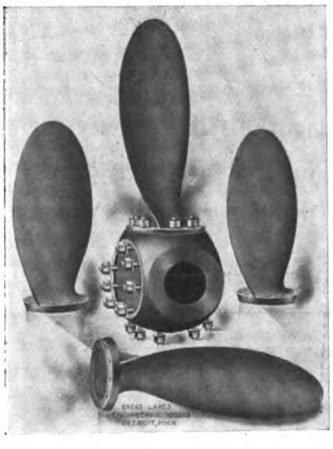
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GEORGE H. RUSSEL, Vice President.

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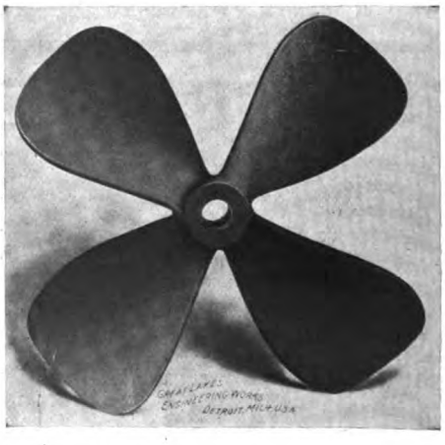


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On Board Sea-going Vessels, NOT INCLUDING New Installations Building or Erecting.

French Navy	360,560 H. P.
English Royal Navy	966,300 "
Russian Imperial Navy	253,800 "
Japanese Imperial Navy	122,700 "
Austrian Imperial Navy	56,700 "
Italian Royal Navy	32,500 "
Chilian Navy	26,500 "
Argentine Navy	13,000 "
The "Messageries Maritimes" Company	87,600 "
Chemins de fer de l'Ouest: (The French Western Railway Co.) Steamships plying between Dieppe and Newhaven	18,500 "
Compagnie Generale Transatlantique	1,500 "
Total Horse Power of Boilers in Use	1,939,660

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Special sizes or shapes to order.

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IRON STEEL
PIG IRON
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Cam Lever Pop Safety Valves and Non-Corrosive Steam Gauges.

give highest efficiency and durability. Specify them and get the best.

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Boston New York Chicago

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Buyers' Directory of the Marine Trade

For a more complete classification than that represented by advertisers in the Marine Review, see the BLUE BOOK OF AMERICAN SHIPPING, marine and naval directory of the United States, published by The Marine Review, Cleveland.

See accompanying index of Advertisers for full addresses of concerns in this directory.

AIR COMPRESSORS, AIR HOISTS, ETC.
Great Lakes Engineering Works.....Detroit.
Mietz, Aug. .....New York.

AIR PORTS, DEAD LIGHTS, ETC.
Marine Mfg. & Supply Co.....New York.

AIR PUMPS AND APPLIANCES.
Fore River Ship & Engine Co..Quincy, Mass.
Great Lakes Engineering Works.....Detroit.

ANCHORS.
Bowers, L. M. & Co.....Binghamton, N. Y.

ANTI-FRICTION METALS.
Cramp, Wm. & Sons.....Philadelphia.

ARTIFICIAL DRAFT FOR BOILERS.
American Ship Building Co.....Cleveland.
Detroit Ship Building Co.....Detroit
Great Lakes Engineering Works.....Detroit
Sturtevant, B. F., Co.....Hyde Park, Mass.

ASH EJECTORS.
Great Lakes Engineering Works.....Detroit.

ATTORNEYS AND PROCTORS IN ADMIRALTY.
Gilchrist, Albert J.....Cleveland.
Goulder, Holding & Masten.....Cleveland.
Hoyt, Dustin & Kelley.....Cleveland.
Jenkins, Russell & Eichelberger....Cleveland.
Kremer, C. E.....Chicago.
MacDonald, Ray G.....Chicago.
Potter & Potter.....Buffalo.
Shaw, Warren, Cady & Oakes.....Detroit.
White, Johnson, McCaslin & Cannon Cleveland

BAROMETERS, MARINE GLASSES, ETC.
Ritchie, E. S. & Sons.....Brookline, Mass.

BELT CONVEYORS.
Link Belt Machinery Co.....Chicago.

BLOCKS, SHEAVES, ETC.
Boston & Lockport Block Co.....Boston, Mass.
Cleveland Block Co.....Cleveland.

BLOWERS.
Power Specialty Co.....Detroit.
Sturtevant, B. F. Co.....Hyde Park, Mass.

BOAT BUILDERS.
Drein, Thos. & Son.....Wilmington, Del.
Kahnweiler's Sons, David.....New York.
Lane & DeGroot....Long Island City, N. Y.
Marine Construction & D. D. Co.....
.....Mariner's Harbor, S. I., N. Y.
Truscott Boat Mfg. Co.....St. Joseph, Mich.
Willard, Chas. P. & Co. Winthrop Harbor, Ill.

BOILER CLEANING DEVICE.
Power Specialty Co.....Detroit.

BOILER COMPOUNDS.
Dearborn Drug & Chemical Works....Chicago.

BOILER MANUFACTURERS.
Almy Water Tube Boiler Co..Providence, R. I.
American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Chicago Ship Building Co.....Chicago.
Cramp, Wm. & Sons.....Philadelphia.
Dearing Water Tube Boiler Co.....Detroit.
Delauney, Belleville & Co...St. Denis, France.
Detroit Ship Building Co.....Detroit.
East End Boiler Works.....Detroit.
Fletcher, W. A. & Co.....Hoboken, N. J.
Fore River Shipbuilding Co.....Quincy, Mass.
Georgian Bay Engineering Works.....
.....Midland, Ont.
Great Lakes Engineering Works.....Detroit.
Kingsford Foundry & Machine Works...
.....Oswego, N. Y.
Marine Iron Works.....Chicago.

BOILER MANUFACTURERS—Continued.
Maryland Steel Co.....Sparrows Point, Md.
Milwaukee Dry Dock Co.....Milwaukee.
Mosher Water Tube Boiler Co....New York.
Newport News Ship Building Co.....
.....Newport News, Va.
New York Shipbuilding Co.....Camden, N. J.
Northwestern Steam Boiler & Mfg. Co....
.....Duluth, Minn.
Quintard Iron Works Co.....New York.
Roberts Safety Water Tube Boiler Co....
.....New York.
Stirling, The Co.....New York.
Superior Ship Building Co.....Superior, Wis.
Taylor Water Tube Boiler Co.....Detroit.

BOILER RIVETS.
Bourne-Fuller Co.....Cleveland.

BOILER STAYBOLTS, IRON OR STEEL, HOLLOW OR SOLID.
Falls Hollow Staybolt Co..Cuyahoga Falls, O.

BRASS AND BRONZE CASTINGS.
Cramp, Wm. & Sons.....Philadelphia.
Fore River Ship & Engine Co..Quincy, Mass.
Great Lakes Engineering Works.....Detroit.
Lunkenheimer Co.....Cincinnati.
Macbeth Iron Co.....Cleveland.

BRIDGES, BUILDERS OF.
Cowing, John P.....Cleveland.
Scherzer Rolling Lift Bridge Co.....Chicago.

BUCKETS, ORE AND COAL.
Brown Hoisting & Conveying Machine Co.
..... Cleveland.
McMyler Mfg. Co.....Cleveland.
Mayo & Bailey .....Chicago.

BULKHEAD DOORS, WATERTIGHT.
"Long Arm" System Co.....Cleveland.

CABIN AND CABINET FINISHING WOODS.
Martin-Barriss Co.....Cleveland.

CANVAS SPECIALTIES.
Baker & Co., H. H.....Buffalo.
Bunker, E. A. .....New York.
Upson-Walton Co.....Cleveland.

CAPSTANS.
American Ship Windlass Co..Providence, R. I.
Hyde Windlass Co.....Bath, Me.
Marine Mfg. & Supply Co.....New York.

CEMENT, IRON FOR REPAIRING LEAKS.
Smooth-On Mfg. Co.....Jersey City, N. J.

CHAINS.
Woodhouse Chain Works.....Trenton, N. J.

CHAIN CONVEYORS, HOISTS.
Brown Hoisting Machinery Co. (Inc.)....
..... Cleveland.
General Electric Co.....Schenectady, N. Y.

CHAIN HOISTS.
Boston & Lockport Block Co....Boston, Mass.

CHARTS.
Penton Publishing Co.....Cleveland.
Potter, J. D.....London.

CLOCKS (Marine and Ship's Bell) AND CHRONOMETERS.
Ashton Valve Co.....Boston.
Ritchie, E. S. & Sons.....Brookline, Mass.

COAL PRODUCERS AND SHIPPERS.
Hanna, M. A. & Co.....Cleveland.
Ironville Dock & Coal Co.....Toledo, O.
Pickands, Mather & Co.....Cleveland.
Pittsburg Coal Co.....Cleveland.

COAL AND ORE HANDLING MACHINERY.
Brown Hoisting Machinery Co. (Inc.)....
..... Cleveland.
Link Belt Machinery Co.....Chicago.
McMyler Mfg. Co.....Cleveland.

COMPASSES.
Ritchie, E. S. & Sons.....Brookline, Mass.

CONDENSERS.
Great Lakes Engineering Works.....Detroit.
Thropp & Sons Co., John E...Trenton, N. J.

CONTRACTORS FOR PUBLIC WORKS.
Breymann & Bros., G. H.....Toledo.
Buffalo Dredging Co.....Buffalo.
Dunbar & Sullivan Dredging Co.....Buffalo.
Fitz-Simons & Connell Co.....Chicago.
Great Lakes Dredge & Dock Co.....Chicago.
Hickler Bros.....Sault Ste. Mari e, Mich.
Lake Superior Contracting & Dredging Co.,
..... Duluth, Minn.
Smith Co., L. P. & J. A.....Cleveland.
Starke Dredge & Dock Co., C. H..Milwaukee.
Sullivan, M.....Detroit.

CORDAGE.
Baker & Co., H. H.....Buffalo.
Upson-Walton Co.....Cleveland.

CORK JACKETS AND RINGS.
Armstrong Cork Co.....Pittsburg, Pa.
Kahnweiler's Sons, D.....New York.

CRANES, TRAVELING.
Brown Hoisting Machinery Co.....Cleveland.
McMyler Mfg. Co.....Cleveland.

DIVING APPARATUS.
Morse, A. J. & Son.....Boston.
Schrader's Son, Inc., A..... ... New York.

DREDGING CONTRACTORS.
Breymann & Bros., G. H.....Toledo.
Buffalo Dredging Co.....Buffalo.
Dunbar & Sullivan Dredging Co.....Buffalo.
Fitz-Simons & Connell Co.....Chicago.
Great Lakes Dredge & Dock Co.....Chicago.
Hickler Bros.....Sault Ste. Marie, Mich.
Lake Superior Contracting & Dredging Co.
..... Duluth, Minn.
Smith Co., L. P. & J. A.....Cleveland.
Starke Dredge & Dock Co., C. H..Milwaukee.
Sullivan, M.....Detroit.

DREDGING MACHINERY.
Quintard Iron Works Co.....New York.

DRYING APPARATUS.
Sturtevant, B. F. Co.....Hyde Park, Mass.

DRY DOCKS.
American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Buffalo Dry Dock Co.....Buffalo.
Chicago Ship Building Co.....Chicago.
Craig Ship Building Co.....Toledo, O.
Cramp, Wm. & Sons.....Philadelphia.
Detroit Ship Building Co.....Detroit.
Great Lakes Engineering Works.....Detroit.
Lockwood Mfg. Co.....East Boston, Mass.
Milwaukee Dry Dock Co.....Milwaukee.
Newport News Ship Building Co.....
.....Newport News, Va.
Shipowners Dry Dock Co.....Chicago.
Superior Ship Building Co....Superior, Wis.

ELECTRIC HOISTS AND CRANES.
General Electric Co.....Schenectady, N. Y.

ELECTRIC LIGHT AND POWER PLANTS.
General Electric Co.....Schenectady, N. Y.
Mietz, Aug. .....New York.
Sturtevant, B. F. & Co.....Hyde Park, Mass.
Thropp & Sons, John E.....Trenton, N. J.

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WANTED and FOR SALE Department.

PROPOSALS.

U. S. ENGINEER OFFICE, Detroit, Mich., July 14, 1905. Sealed proposals for dredging at Saginaw and Sebewaing Rivers, Mich., will be received here until 3:00 p. m., August 14, 1905, and then publicly opened. Information furnished on application. LANSING H. BEACH, Major, Engrs. Aug. 10

FOR SALE.

For Sale.

One marine boiler and engine for sale, suitable for steam barge. Address E. B. Johnson, Chaumont, N. Y.

For Sale.

A steam barge, with capacity of about 250,000 M. lumber. P. P. Schnorbach, Muskegon, Mich.

For Sale.

Fore and aft Compound Marine Engine, size 6 x 12 x 6, and in perfect condition. Built by the Marine Iron Works, Chicago. Inquire of H. B. Larsen, Manistee, Mich.

Spile Driver and Scow For Sale.

A spile driver and scow 55 ft. x 28 ft., square end, drop 50 ft.; two hammers 3,800 lb. and 2,000 lb. Double 8¼ x 10 engines, vertical boiler. Cables, blocks, lines, tools, etc., all in complete working order. Immediate delivery. May be inspected at Detroit. Michigan Contracting Co., 860 Greenwood Ave., Detroit, Mich.

Marine Gasoline Engine.

FOR SALE.—A 4-cylinder, 25-H. P. Leighton gasoline marine engine, with reversible propeller; perfect condition; slightly used; cost $1,200; sell for $500 cash. Box 577, Syracuse, N. Y.

FOR SALE.

Yacht for Sale.

A splendid 100-ft. gasoline cruising yacht. Fully equipped in every particular and now in commission. Outfit very complete in deck, cabin and engineer's department. This boat is equipped with three large state-rooms, large dining-room, after-cabin, two toilet rooms, crew's quarters, galley, etc. Ten to fifteen passengers can be accommodated very comfortably on long cruise. Very economical in operation, requiring but crew of three. 706 Bourse Bldg., Philadelphia.

For Sale.

New, up-to-date Gasoline Launch, 53 ft. on keel, 12-ft. beam, cabin space 34 ft.; will seat fifty people comfortably; state room, two berths to accommodate four; 40 H. P. engine; light plant; galley, toilet; cushion seats and backs; gasoline tank 215 gallons; ice house, forward capacity, two tons; windlass, towing bits, and everything complete; draws 3 ft. of water; speed 12 to 13 knots per hour. This boat is complete in every particular. Price, $4,000.00. E. C. Brown, Newport News, Va.

TUGS AND LUMBER SCOW.

One small harbor tug **Alice Shipman**, one large tug **Temple Emery** and large lumber tow barge. Can be seen at Two Rivers, Wisconsin.

Best offer wanted.

Fidelity Trust Company, Trustee,
Two Rivers Manufacturing Co.
Milwaukee, Wisconsin.

FOR SALE.

Crane.

For Sale Cheap—Brown Hoisting Machinery Co. all iron Post Jib Crane, 15 ton capacity, 35 ft. 3 in. radius of hook, 18 ft. 6 in. lift. The hoisting mechanism is driven by dust-proof motor.

Photograph and price mailed on application.

A. Garrison Foundry Co., Pittsburg, Pa.

For Sale.

One dredge hoisting engine, double cylinders, 14½ by 14 in. stroke; clutch gear, on very heavy cast frame, drum fitted for 1½ in. cable and well suited for hard digging; all as good as new. Address JAMES PRYOR, Houghton, Mich.

Marine Boiler.

For Sale.—One 50 H. P. Scotch Marine Boiler, 10 ft. long, 78 in. diameter, 160 lbs. steam pressure. Manufactured by Ritter & Co., Buffalo, N. Y. In first-class shape. For particulars, write The Detroit Stove Works, Detroit, Mich. t. f.

Dock Lease for Sale.

Long lease of valuable dock at Sault Ste. Marie, Mich. Will sell or rent for long or short term. F. R. Warner, Trustee, Sault Ste. Marie, Mich.

FOR SALE $3500.00.
The Steamer Gordon Campbell.

Burned on spar-deck, forward only—easy to cut down to lumber barge, to carry million feet. Machinery, boilers and hull untouched and in good condition. Boat in dry dock and thoroughly overhauled last summer. Can be seen in Chicago. Address Room 613, 59 Dearborn St., Chicago. t f

FOR SALE



The D. Robeson SHIP CHANDLERY BUSINESS
at PORT HURON, MICH.

Established 36 years. Does a large business in the sale of Cordage, Duck, Wire Rope, Blocks, Paints, Oils, Varnishes, Brushes; Roofing, Rubber Hose, Building Paper. Manufacturer of Sails, Flags, Tents and Awnings. Building is 40 x 70, two story brick, located close to boat landing. Ill health reason for disposing of real estate and business. For further particulars, write to

SCHOOLCRAFT & CO., Port Huron, Mich.



For Sale

Launch Factory and stock of engines and high grade hulls, finished and unfinished. One of the best factories in the country, with new machinery, good buildings, a fine testing tank, and excellent facilities for launching and shipping. Located above high water on the Ohio River. Frontage of ground, 250 ft., depth, 800 ft. Also a stock of fine launches 18 to 30 ft. long, lumber and other material. This property must be sold. Stockholders are engaged in other business and can not give it attention. With proper management and attention a fine business can be established. Write for particulars, or come and see the plant.

Neptune Launch & Mfg. Co.

Evansville, Indiana.

If you have any second hand vessel property or marine machinery that you want to dispose of, this page will do it for you in short order. Try it.

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Buyers' Directory of the Marine Trade.—*Continued.*

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American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Chicago Ship Building Co.....Chicago.
Chase Machine Co.....Cleveland.
Cramp, Wm. & Sons.....Philadelphia.
Craig Ship Building Co.....Toledo, O.
Detroit Ship Building Co.....Detroit.
Fletcher, W. & A. Co.....Hoboken, N. J.
Fore River Shipbuilding Co....Quincy, Mass.
Great Lakes Engineering Works.Detroit, Mich.
Hall Bros. .....Philadelphia.
Lockwood Mfg. Co.....East Boston, Mass.
Marine Iron Works.....Chicago.
Maryland Steel Co.....Sparrows Point, Md.
Mietz, Aug.....New York.
Milwaukee Dry Dock Co.....Milwaukee.
Mosher, Chas. D.....New York.
Moulton Steering Engine Co.....New York.
Newport News Ship Building Co.....
.....Newport News, Va.
New York Shipbuilding Co....Camden, N. J.
Northwestern Steam Boiler & Mfg. Co...
..... Duluth, Mich.
Quintard Iron Works Co.....New York.
Roach's Ship Yard.....Chester, Pa.
Sheriffs Mfg. Co.....Milwaukee.
Superior Ship Building Co....Superior, Wis.
Thropp, J. E. & Sons Co.....Trenton, N. J.
Trout, H. G.....Buffalo.

ENGINE ROOM TELEGRAPH, CALL BELLS, ETC.
Cory, Chas. & Son.....New York.
Marine Mfg. Supply Co.....New York.

ENGINE TESTING.
Kreer & Parsons.....Chicago.

ENGINEERING SPECIALTIES AND SUPPLIES.
Crane Co. .....Chicago.
Kieley & Mueller .....New York.
Lunkenheimer Co. .....Cincinnati.
New York Belting & Packing Co..New York.
Northwestern Steam Boiler & Mfg. Co...
..... Duluth, Minn.

ENGINEERS, MARINE, MECHANICAL, CONSULTING.
Hynd, Alexander .....Cleveland.
Hunt, Robt. W. & Co.....Chicago.
Kidd, Joseph.....Duluth, Minn.
Lovejoy, H. O.....Buffalo.
Mosher, Chas. D.....New York.
Nacey, James .....Cleveland.
Rice, Henry .....Buffalo.
Roelker, H. B. .....New York.
Wood, W. J. .....Chicago.

FANS FOR VENTILATION, EXHAUST, ETC.
Sturtevant, B. F. Co.....Hyde Park, Mass.

FEED WATER PURIFIERS AND HEATERS.
Greacen-Derby Engineering Co.....
.....Perth Amboy, N. J.
Ross Valve Co.....Troy, N. Y.

FIRE EXTINGUISHERS.
Safety Fire Extinguisher Co.....New York.

FIXTURES FOR LAMPS, OIL OR ELECTRIC.
General Electric Co.....Schenectady, N. Y.

FORGES.
Sturtevant, B. F. Co.....Boston.
Sutton Co., C. E.....Toledo, O.

FORGINGS FOR CRANK, PROPELLER OR THRUST SHAFTS, ETC.
Cleveland City Forge & Iron Co...Cleveland.
Fore River Shipbuilding Co.....Quincy, Mass.
Macbeth Iron Co.....Cleveland.

FLUE WELDING.
Fix's, S. Sons.....Cleveland.

FUEL ECONOMIZERS.
Sturtevant Co., B. F.....Hyde Park, Mass.

FUELING COMPANIES AND COAL DEALERS.
Hanna, M. A. & Co.....Cleveland.
Ironville Dock & Coal Co.....Toledo, O.
Parker Bros. Co., Ltd.....Detroit.
Pickands, Mather & Co.....Cleveland.
Pittsburg Coal Co.....Cleveland.
Smith, Stanley B., & Co.....Detroit.
Smith Coal & Dock Co., Stanley B. Toledo, O.

FUELING PLANTS, BUILDERS OF
Link Belt Machinery Co.....Chicago.

FURNACES FOR BOILERS.
Continental Iron Works.....New York.

GAS BUOYS.
Safety Car Heating & Lighting Co..New York.

GAS AND GASOLINE ENGINES.
Chase Machine Co.....Cleveland.
Georgian Bay Engineering Works.....
.....Midland, Ont.

GAUGES, STEAM AND VACUUM.
Ashton Valve Co.....Boston.
Lunkenheimer Co. .....Cincinnati.

GAUGES, WATER.
Bonner Co., Wm. T.....Boston.
Lunkenheimer Co. .....Cincinnati, O.

GRAPHITE.
Dixon Crucible Co., Joseph..Jersey City, N. J

GREASE EXTRACTORS.
Greacen-Derby Engineering Co.....
.....Perth Amboy, N. J.

HAMMERS, STEAM.
Chase Machine Co.....Cleveland.

HEATING APPARATUS.
Sturtevant, B. F. Co.....Hyde Park, Mass.
Sutton Co., C. E.....Toledo, O.

HOISTS FOR CARGO, ETC.
American Ship Building Co.....Cleveland.
Brown Hoisting Machinery Co. (Inc.)....
..... Cleveland.
Chase Machine Co.....Cleveland.
General Electric Co.....New York.
Georgian Bay Engineering Works.....
.....Midland, Ont.
Hyde Windlass Co.....Bath, Me.
McMyler Mfg. Co.....Cleveland.
Marine Iron Co.....Bay City.
Mietz, Aug. .....New York.

HOLLOW SHAFTINGS, IRON OR STEEL.
Falls Hollow Staybolt Co...Cuyahoga Falls, O.

HOLLOW STAYBOLT IRON.
Falls Hollow Staybolt Co...Cuyahoga Falls, O.

HYDRAULIC DREDGES.
Great Lakes Engineering Works.....Detroit.

HYDRAU. IC TOOLS.
Watson-Stillman Co., The.....New York.

ICE MACHINERY.
Great Lakes Engineering Works.....Detroit.
Roelker, H. B.....New York.

INDICATORS FOR STEAM ENGINES.
Ashton Valve Co.....Boston.

INJECTORS.
American Injector Co.....Detroit.
Crane Co. .....Chicago.
Jenkins Bros. .....New York.
Lunkenheimer Co.....Cincinnati.
Penberthy Injector Co.....Detroit, Mich.

INSURANCE, MARINE.
Elphicke, C. W. & Co.....Chicago.
Fleming & Co., E. J.....Chicago.
Gilchrist & Co., C. P.....Cleveland.
Hawgood & Co., W. A.....Cleveland.
Helm & Co., D. T.....Duluth.
Hutchinson & Co.....Cleveland.
McCarthy, T. R.....Montreal.
McCurdy, Geo. L.....Chicago.
Mitchell & Co.....Cleveland.
Parker Bros. Co., Ltd.....Detroit.
Peck, Chas. E. & W. F..New York & Chicago.
Prindiville & Co.....Chicago.
Richardson, W. C.....Cleveland.
Sullivan, D. & Co.....Chicago.

IRON CASTINGS.
Sutton Co., C. E.....Toledo, O.

IRON ORE AND PIG IRON.
Bourne-Fuller Co.....Cleveland, O.
Hanna, M. A. & Co.....Cleveland.
Pickands, Mather & Co.....Cleveland.

LAUNCHES—STEAM, NAPHTHA, ELECTRIC.
Georgian Bay Engineering Works.....
.....Midland, Ont.
Marine Iron Works.....Chicago.
Truscott Boat Mfg. Co.....St. Joseph, Mich.
Willard, Chas. P.....Winthrop Harbor, Ill.

LIFE PRESERVERS, LIFE BOATS, BUOYS.
Armstrong, Cork Co.....Pittsburg.
Drein, Thos. & Son.....Wilmington, Del.
Gaynor, T. F .....New York.
Kahnweiler's Sons, D.....New York.
National Cork Co.....Brooklyn.

LIGHTS, SIDE AND SIGNAL.
Russell & Watson .....Buffalo.

LOGS.
Nicholson Ship Log Co.....Cleveland.
Walker & Sons, Thomas....Birmingham, Eng.
Also Ship Chandlers.

LUBRICATING GRAPHITE.
Dixon Crucible Co., Joseph..Jersey City, N. J.

LUBRICATORS.
Crane Co.....Chicago.
Lunkenheimer Co. .....Cincinnati.

LUMBER.
Martin-Barriss Co.....Cleveland.
Rayner, J. .....Chicago.

MACHINISTS.
Chase Machine Co.....Cleveland.
Hickler Bros.....Sault Ste. Marie, Mich.
Lockwood Mfg. Co.....East Boston, Mass.

MACHINE TOOLS (WOOD WORKING).
Atlantic Works, Inc.....Philadelphia.

MARINE RAILWAYS.
Hickler Bros.....Sault Ste. Marie, Mich.

MARINE RAILWAYS, BUILDERS OF.
Crandall & Son, H. I.....East Boston, Mass.

MATTRESSES, CUSHIONS, BEDDING.
Fogg, M. W.....New York.

MECHANICAL DRAFT FOR BOILERS.
American Ship Building Co.....Cleveland.
Detroit Ship Building Co.....Detroit.
Great Lakes Engineering Works.....Detroit.
Sturtevant, B. F. Co.....Hyde Park, Mass.

METALLIC PACKING.
Katzenstein, L. & Co.....New York.

MOTORS, GENERATORS—ELECTRIC.
Fisher Electrical Works.....Detroit.
General Electric Co.....Schenectady, N. Y.
Sturtevant, B. F. Co.....Hyde Park, Mass.

NAUTICAL INSTRUMENTS.
Ritchie, E. S., & Sons.....Brookline, Mass.

NAVAL ARCHITECTS.
Hynd, Alexander .....Cleveland.
Kidd, Joseph .....Duluth, Minn.
Lovejoy, H. O. .....Buffalo.
Mosher, Chas. D.....New York.
Nacey, James .....Cleveland.
Rice, Henry .....Buffalo.
Wood, W. J. .....Chicago.

OAKUM.
Stratford, Oakum Co.....Jersey City, N. J.

OIL ENGINES.
Mietz, Aug. .....New York.

OILS AND LUBRICANTS.
Dixon Crucible Co., Joseph..Jersey City, N. J.
Standard Oil Co.....Cleveland.

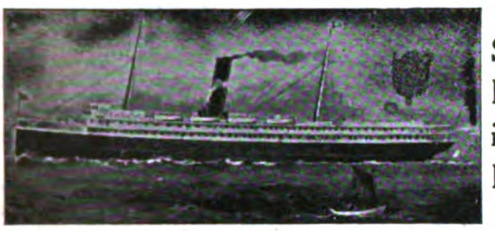
PACKING.
Crane Co. .....Chicago.
Jenkins Bros. .....New York.
Katzenstein, L. & Co.....New York.

PAINTS.
Baker, Howard H. & Co.....Buffalo.
Upson-Walton Co. .....Cleveland.

PATTERN SHOP MACHINERY.
Atlantic Works, Inc.....Philadelphia.

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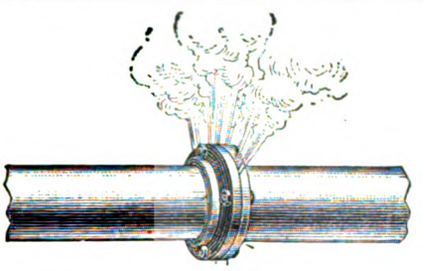
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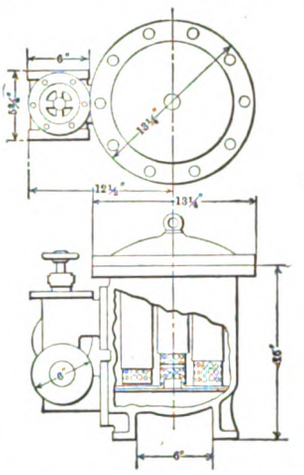
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Buyers' Directory of the Marine Trade.—*Continued.*

PILE DRIVING AND SUBMARINE WORK.

Buffalo Dredging Co.....Buffalo.
Dunbar & Sullivan Dredging Co.....Buffalo.
Fitz-Simons & Connell Co.....Chicago.
Great Lakes Dredge & Dock Co.....Chicago.
Hickler Bros.....Sault Ste. Marie, Mich.
Lake Superior Contracting & Dredging Co. ..... Duluth, Minn.
Parker Bros. Co., Ltd.....Detroit.
Smith Co., L. P. & J. A.....Cleveland.
Starke Dredge & Dock Co., C. H..Milwaukee.
Sullivan, M..... Detroit

PIPE, WROUGHT IRON.

Bourne-Fuller Co.....Cleveland, O.
Crane Co. .....Chicago.
Macbeth Iron Co.....Cleveland.
Reading Iron Co.....Reading. Pa.

PLANING MILL MACHINERY.

Atlantic Works, Inc.....Philadelphia.

PLATES—SHIP, STRUCTURAL, ETC.

Bourne-Fuller Co.....Cleveland, O.
Otis Steel Co.....Cleveland.

PRESSURE REGULATORS.

Kieley & Mueller .....New York.
Ross Valve Co.....Troy, N. Y.

PROPELLER WHEELS.

American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Cramp, Wm. & Sons.....Philadelphia.
Detroit Ship Building Co.....Detroit.
Fore River Shipbuilding Co.....Quincy, Mass.
Great Lakes Engineering Works.....Detroit.
Hyde Windlass Co.....Bath, Me.
Lockwood Mfg. Co. .....East Boston, Mass.
Marine Iron Works.....Chicago.
Milwaukee Dry Dock Co.....Milwaukee.
Newport News Ship Building Co..... Newport News, Va.
Roelker, H. B.....New York.
Sheriffs Mfg. Co.....Milwaukee.
Superior Ship Building Co....Superior, Wis.
Thropp & Sons Co., J. E.....Trenton, N. J.
Trout, H. G.....Buffalo.

PROJECTORS, ELECTRIC.

General Electric Co.....Schenectady, N. Y.

PUMPS FOR VARIOUS PURPOSES.

Blake, Geo. F., Mfg. Co.....New York.
Great Lakes Engineering Works.....Detroit.
Marine Iron Works.....Chicago.
Kingsford Foundry & Machine Works.... .....Oswego, N. Y.

PUNCHES AND SHEARS.

Sutton Co., C. E.....Toledo, O.

RANGES.

Stamford Foundry Co.....Stamford, Conn.

REFRIGERATING APPARATUS.

Great Lakes Engineering Works.....Detroit.
Roelker, H. B.....New York.

REGISTER FOR CLASSIFICATION OF VESSELS.

Great Lakes Register.....Cleveland.

REPAIRS—ENGINE AND BOILER.

(See also Boiler Manufacturers and Engine Builders.)
Georgian Bay Engineering Works..... .....Midland, Ont.

RIVETS, STEEL FOR SHIPS AND BOILERS.

Bourne-Fuller Co.....Cleveland, O.

SAFETY VALVES.

Ashton Valve Co.....Boston.
Crane Co. .....Chicago.
Lunkenheimer Co. .....Cincinnati.

SAIL MAKERS.

Baker, Howard H. & Co.....Buffalo.
Upson-Walton Co.....Cleveland.

SALVAGE COMPANIES.

See Wrecking Companies.

SEARCH LIGHTS.

General Electric Co.....Schenectady, N. Y.

SHAFTING, HOLLOW.

Falls Hollow Staybolt Co..Cuyahoga Falls, O.

SHEARS.

See Punches, and Shears.

SHIP AND BOILER PLATES AND SHAPES.

Bourne-Fuller Co.....Cleveland, O.
Otis Steel Co.....Cleveland.

SHIP BUILDERS.

American Ship Building Co.....Cleveland.
Atlantic Works .....East Boston, Mass.
Buffalo Dry Dock Co.....Buffalo.
Cramp, Wm. & Sons.....Philadelphia.
Craig Ship Building Co.....Toledo, O.
Chicago Ship Building Co.....Chicago.
Detroit Ship Building Co.....Detroit.
Fore River Shipbuilding Co.....Quincy, Mass.
Great Lakes Engineering Works.....Detroit.
Lockwood Mfg. Co.....East Boston, Mass.
Maryland Steel Co.....Sparrows Point, Md.
Milwaukee Dry Dock Co.....Milwaukee.
Newport News Ship Building Co..... .....Newport News, Va.
New York Shipbuilding Co....Camden, N. J.
Roach's Ship Yard.....Chester, Pa.
Shipowner's Dry Dock Co.....Chicago.
Smith & Son, Abram.....Algonac, Mich.

SHIP CHANDLERS.

Baker, Howard H. & Co.....Buffalo.
Marine Mfg. & Supply Co.....New York.
Upson-Walton Co.....Cleveland.

SHIP DESIGNERS.

Kidd, Joseph .....Duluth.
Rice & Lovejoy .....Buffalo.
Steel, Nacey & Hynd.....Cleveland.
Wood, W. J.....Chicago.

SHIP LANTERNS AND LAMPS.

Russell & Watson.....Buffalo.

SHIPMATE RANGES.

Stamford Foundry Co.....Stamford, Conn.

SHIP TIMBER.

Martin-Barriss Co.....Cleveland.
Rayner, J. .....Chicago.

SMOOTH-ON COMPOUND, FOR REPAIRS.

Smooth-On Mfg. Co.....Jersey City, N. J.

STAYBOLT IRON OR STEEL BARS, HOLLOW OR SOLID.

Falls Hollow Staybolt Co..Cuyahoga Falls, O.

STEAM VESSELS FOR SALE.

Gilchrist & Co., C. P.....Cleveland.
Holmes, Samuel .....New York.
Lester, S. S.....Quebec, Can.
McCarthy, T. R.....Montreal, Can.

STEAMSHIP LINES, PASS. AND FREIGHT.

American Line .....New York.
Anchor Line .....Buffalo.
Boston Steamship Co.....Boston.
Cleveland & Buffalo Transit Co.....Cleveland.
International Mercantile Marine Co..... .....Philadelphia.
Mallory Line ....New York.
Merchants' Montreal Line.....Montreal.
New York & Cuba Mail S. S. Co...New York.
Red Star Line.....New York.
United Fruit Co.....Boston

STEEL CASTINGS.

Otis Steel Co.....Cleveland.
Sutton Co., C. E.....Toledo, O.

STEERING APPARATUS.

American Ship Building Co.....Cleveland.
Chase Machine Co.....Cleveland.
Detroit Ship Building Co.....Detroit.
Hyde Windlass Co.....Bath, Me.
Marine Mfg. & Supply Co.....New York.
Moulton Steering Engine Co.....New York.
Sheriffs Mfg. Co.....Milwaukee.

SUBMARINE DIVING APPARATUS.

Morse & Son, A. J.....Boston.
Schrader's Son, Inc., A..... ....New York.

SURVEYORS, MARINE.

Gaskin, Edward .....Buffalo.
Hynd, Alexander .....Cleveland.
Lovejoy, H. O.....Buffalo.
Matteson & Drake .....Philadelphia.
Parker Bros. Co., Ltd.....Detroit.
Nacey, James .....Cleveland.
Rice, Henry .....Buffalo.
Steel, Adam .....Cleveland.
Wood, W. J.....Chicago.

TESTS OF MATERIALS.

Hunt, Robert W. & Co.....Chicago.
Lunkenheimer Co.....Cincinnati, O.

TOOLS, METAL WORKING, FOR SHIP AND ENGINE WORKS.

Watson-Stillman Co.....New York.

TOOLS, WOOD WORKING.

Atlantic Works, Inc.....Philadelphia.

TOWING MACHINES.

American Ship Windlass Co..Providence, R. I.
Chase Machine Co.....Cleveland.

TOWING COMPANIES.

Donnelly Salvage & Wrecking Co..... .....Kingston, Ont.
Great Lakes Towing Co.....Cleveland.

TRAPS, STEAM.

Kieley & Mueller .....New York.
Sturtevant Co., B. F.....Hyde Park, Mass.

TRUCKS.

Boston & Lockport Block Co.....Boston.

TUBING, SEAMLESS.

Shelby Steel Tube Co.....Pittsburg, Pa.

VALVES, STEAM SPECIALTIES, ETC.

Ashton Valve Co.....Boston.
Crane Co. .....Chicago.
Jenkins Bros. .....New York.
Kieley & Mueller.....New York.
Lunkenheimer Co.....Cincinnati.
Ross Valve Co.....Troy, N. Y.

VALVES FOR WATER AND GAS.

Lunkenheimer Co.....Cincinnati.
Ross Valve Co.....Troy, N. Y.

VARNISHES.

Detroit Varnish Co.....Detroit.
Detroit White Lead Works.....Detroit.
Also Ship Chandlers.

VENTILATING APPARATUS FOR SHIPS.

Sturtevant, B. F. Co.....Hyde Park, Mass.
Sutton Co., C. E.....Toledo, O.

VESSEL AND FREIGHT AGENTS.

Boland, John J.....Buffalo.
Brown & Co.....Buffalo.
Elphicke, C. W. & Co.....Chicago.
Fleming & Co., E. J.....Chicago.
Gilchrist & Co., C. P.....Cleveland.
Hall, John B.....Buffalo.
Helm & Co., D. T.....Duluth.
Hawgood & Co., W. A.....Cleveland.
Holmes, Samuel .....New York.
Hutchinson & Co.....Cleveland.
Lester, S. S. .....Quebec, Can.
McCarthy, T. R.....Montreal.
Mitchell & Co.....Cleveland.
Parker Bros. Co., Ltd.....Detroit.
Prindiville & Co.....Chicago.
Richardson, W. C.....Cleveland.
Sullivan, D. & Co.....Chicago.

WATER GAUGES.

Bonner Co., Wm. T.....Boston.
Lunkenheimer Co.....Cincinnati, O.

WATERTIGHT BULKHEAD DOORS.

"Long Arm" System Co.....Cleveland.

WHISTLES, STEAM.

Ashton Valve Co.....Boston.
Lunkenheimer Co..... Cincinnati.

WILFORD'S WATERPROOF CLOTH.

Bunker, E. A. .....New York.

WIRE ROPE AND WIRE ROPE FITTINGS.

Baker, H. H. & Co.....Buffalo.
DeGrauw, Aymar & Co.....New York.
Upson-Walton Co.....Cleveland.

WINDLASSES.

American Ship Windlass Co..Providence, R. I.
American Ship Building Co.....Cleveland.
Hyde Windlass Co.....Bath, Me.
Marine Mfg. & Supply Co.....New York.

WINCHES.

American Ship Windlass Co..Providence, R. I.
Georgian Bay Engineering Works..... .....Midland, Ont.
Hyde Windlass Co.....Bath, Me.

WOOD WORKING MACHINERY.

Atlantic Works, Inc.....Philadelphia.

WOODS, FOREIGN.

Rayner, J. .....Chicago.

WRECKING AND SALVAGE COMPANIES.

Donnelly Salvage & Wrecking Co..... .....Kingston, Ont.
Great Lakes Towing Co.....Cleveland.
Parker Bros. Co., Ltd.....Detroit.

YACHT AND BOAT BUILDERS.

Drein, Thos. & Son.....Wilmington, Del.
Georgian Bay Engineering Works..... .....Midland, Ont.
Truscott Boat Mfg. Co.....St. Joseph, Mich.

YAWLS.

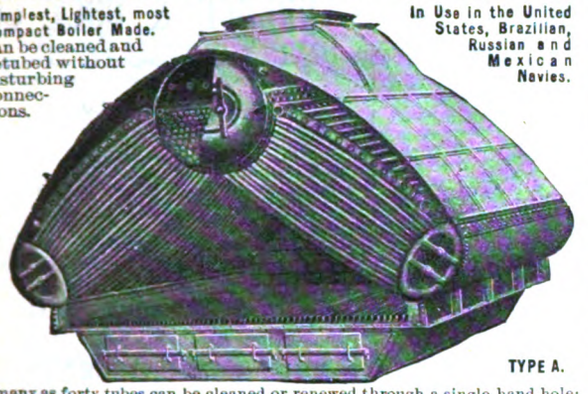
Drein, Thos. & Son.....Wilmington, Del.

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Simplest, Lightest, most Compact Boiler Made. can be cleaned and retubed without disturbing connections.

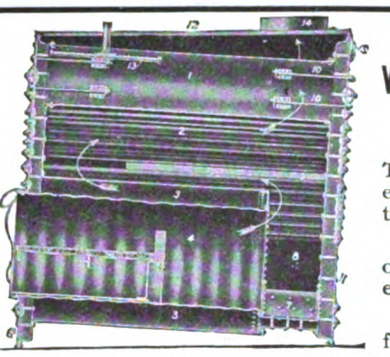
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Internally Fired.

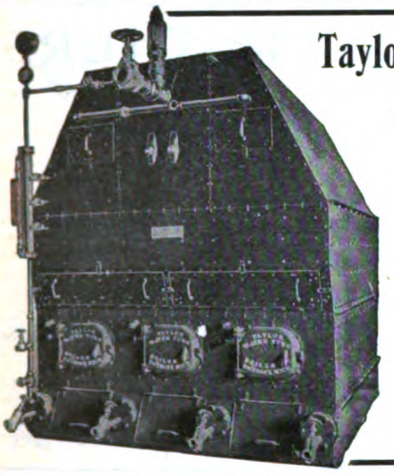
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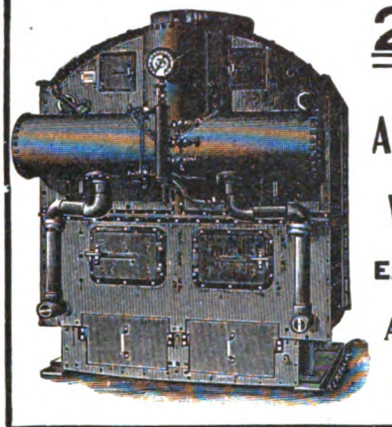


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Free circulation type.

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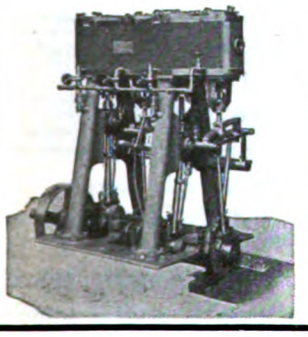
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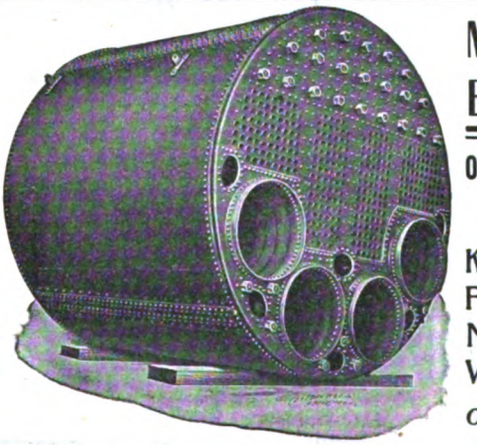
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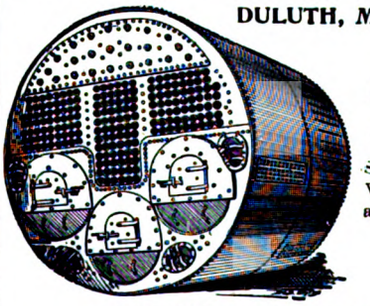
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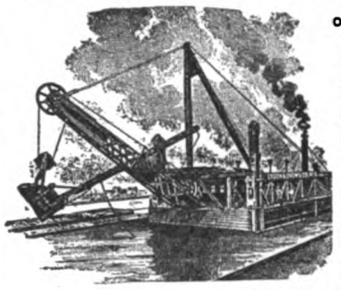
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McMahon & Montgomery Co.
Chicago Dredging & Dock Co.
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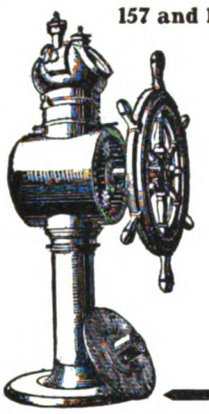
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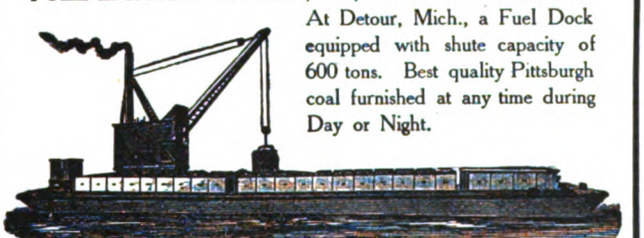


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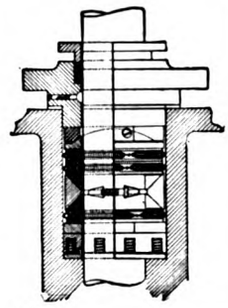
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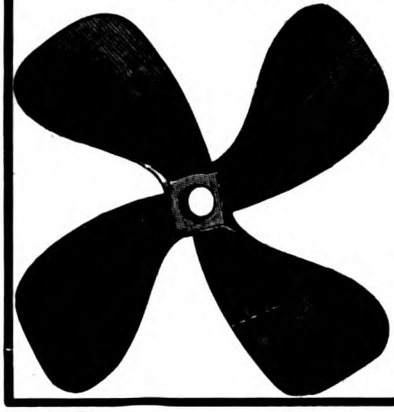
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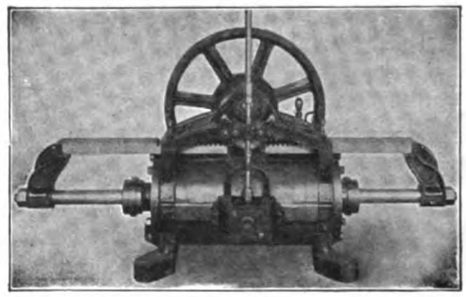


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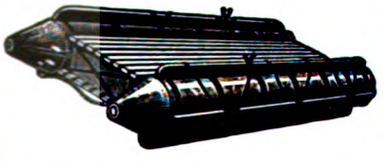
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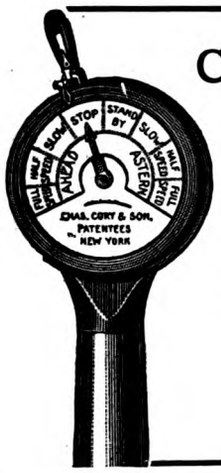
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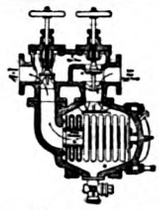
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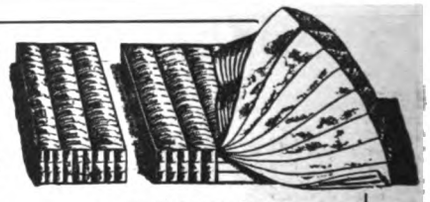
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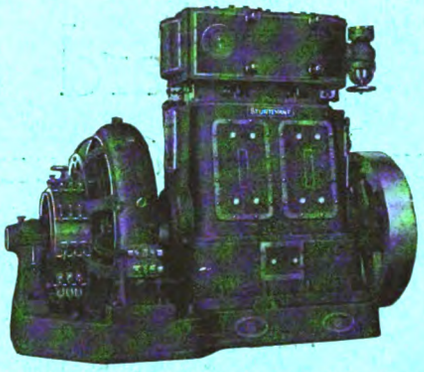
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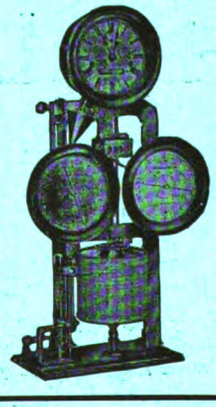
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